COLLINS

MODEL 51V

GLIDE SLOPE RECEIVER

INSTRUCTION BOOK

INSTRUCTION BOOK

for

MODEL 51V

GLIDE SLOPE RECEIVER

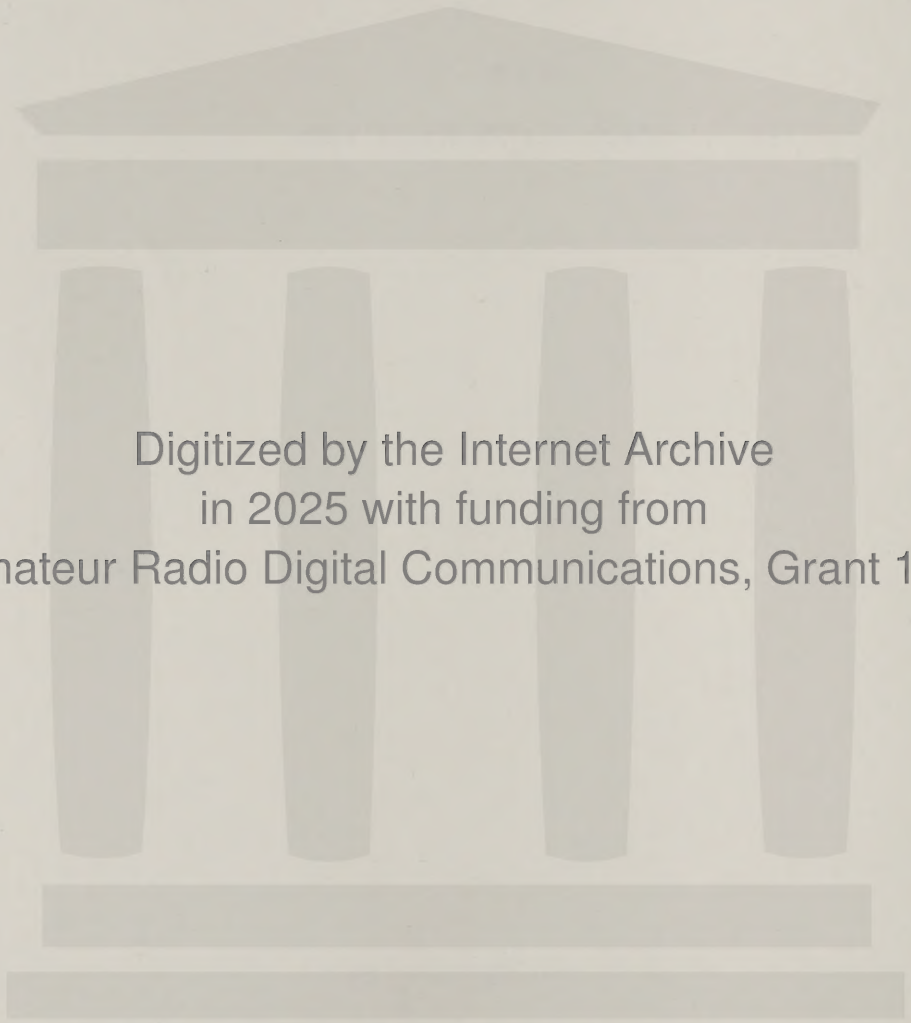
Manufactured By

COLLINS RADIO COMPANY

Cedar Rapids, Iowa

520 9430 00

JUL 16 1951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GUARANTEE

The equipment described herein is sold under the following guarantee:

Collins agrees to repair or replace, without charge, any equipment, parts or accessories which are defective as to design, workmanship or material, and which are returned to Collins at its factory in Cedar Rapids, Iowa, transportation prepaid, provided that the foregoing shall not be applicable to.

(a) Equipment or accessories as to which notice of the claimed defect is not given Collins within one year from date of delivery;

(b) Equipment and accessories manufactured by others than Collins, tubes and batteries, all of which are subject only to such adjustment as Collins may obtain from supplier thereof;

(c) Equipment or accessories which shall fail to operate in a normal or proper manner due to exposure to excessive moisture in the atmosphere or otherwise after delivery, any such failure not being deemed a defect within the meaning of the foregoing provisions.

Collins further guarantees that any radio transmitter described herein will deliver full radio frequency power output at the antenna lead when connected to a suitable load, but such guarantee shall not be construed as a guarantee of any definite coverage or range of said apparatus.

The guarantee of these paragraphs is void if equipment is altered or repaired by others than Collins.

Notice of any claimed defect must be given to Collins prior to return of any item. Such notice must give full information as to nature of defect and identification (including part number if possible) of part considered defective. Upon receipt of such notice, Collins will promptly advise respecting return of equipment. Failure to secure our advice prior to the forwarding of goods for return may cause unnecessary delay in the handling of such merchandise.

No other warranties, expressed or implied, shall be applicable to said equipment, and the foregoing shall constitute the Buyer's sole right and remedy under the agreements in this paragraph contained. In no event shall Collins have any liability for consequential damages, or for loss, damage or expense directly or indirectly arising from the use of the products, or any inability to use them either separately or in combination with other equipment or materials, or from any cause.

HOW TO ORDER REPLACEMENT PARTS

When ordering replacement parts, you should direct your order as indicated below and furnish the following information insofar as applicable:

Address: Collins Radio Company
Sales Service Department
Cedar Rapids, Iowa

Information Needed:

(A) Quantity required
(B) Part number of item
(C) Item number (obtain from Parts List or Schematic Diagram)
(D) Type number of unit
(E) Serial number of unit
(F) Serial number of equipment

HOW TO RETURN MATERIAL OR EQUIPMENT

If, for any reason, you should wish to return material or equipment, whether under the guarantee or otherwise, you should notify us, giving full particulars including the details listed below, insofar as applicable. Upon receipt of such notice, Collins will promptly advise you respecting the return. Failure to secure our advice prior to the forwarding of the goods or failure to provide full particulars may cause unnecessary delay in handling of your returned merchandise.

Address: Collins Radio Company
Sales Service Department
Cedar Rapids, Iowa

Information Needed:

(A) Date of delivery of equipment
(B) Date placed in service
(C) Number of hours in service
(D) Part number of item
(E) Item number (obtain from Parts List or Schematic Diagram)
(F) Type number of unit from which part is removed
(G) Serial number of unit
(H) Serial number of the complete equipment
(I) Nature of failure
(J) Cause of failure
(K) Remarks

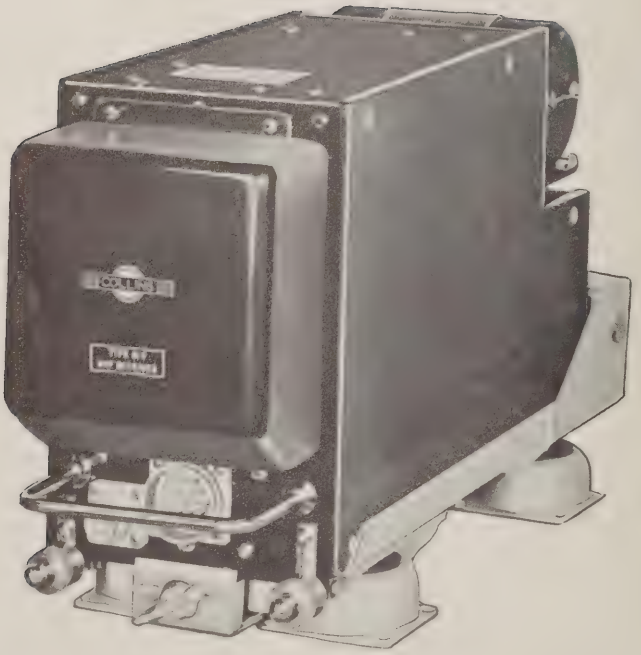


FIGURE 1-1 51V RECEIVER ON
504 3570 001 SHOCKMOUNT

SECTION 1

GENERAL DESCRIPTION

1.1. GENERAL.

1.1.1. PURPOSE OF INSTRUCTION BOOK. - This instruction book has been prepared to assist in the installation, operation and maintenance of the Type 51V Glide Slope Receiver.

1.1.2. PURPOSE OF EQUIPMENT. - Radio Receiver Model 51V is designed to give vertical guidance to a pilot during aircraft landing operations. This equipment is used in conjunction with the Model 51R Navigation Receiver which gives lateral guidance to complete the navigation system.

The 51V ultra-high frequency "glide-slope" receiver is used to pick up signals from an associated glide-slope transmitter located adjacent to the landing strip or runway. One or two cross-pointer indicators provide visual indication to the pilot of the position of the aircraft with relation to the glide path.

The radio receiver is designed to operate in the frequency range of 329.3 through 335.0 mc on a 300 kc, 20 channel basis. One facility is provided, namely, that of receiving glide-slope signals modulated with 90 and 150 cycles on any of 20 channels in the range of the receiver. The operating frequency is changed by changing crystals by means of a frequency selecting system designed to operate from the standardized control unit employed in the R/O system now being implemented. This control unit, the Collins Model 314U selects the companion glide-slope frequency at the same time as the desired localizer frequency is selected in the navigation receiver. The crystals are plug-in type and may be changed to suit the individual requirements.

1.1.3. GENERAL DESCRIPTION.

(a) MECHANICAL. - The receiver, including the r-f and the indicator circuits and dynamotor is mounted in a case whose dimensions are the same as 1/2 ATR unit size except that the length is 7" shorter, namely 12-9/16". This corresponds to a JAN case size of A-1-B. All connections, except the antenna, enter the set through a rear plug, Cannon type DPD-32-34P-2. An extractor is provided on the shockmount to aid in installing and removing the receiver. The front panel housing contains the crystals, relays, adjusting potentiometers and the test jack.

A kit is available by which the receiver can be provided with a front connector and cleats so as to become interchangeable, mechanically and electrically, with the R89B glide-slope receiver.

(b) ELECTRICAL. - The Collins 51V Glide-Slope Receiver covers the navigation band of 329.3 to 335.0 megacycles on a 20 channel basis. A positive eleven wire system is employed for remote selection of frequency from the standardized control unit (Collins Type 314U). The receiver is a single conversion superheterodyne type employing a 20.7 mc intermediate frequency (i-f). The use of five tuned circuits ahead of the converter provides approximately 65 db of image rejection - the antenna contributes additional attenuation of 10 to 15 db. The injection frequency is determined by means of selecting one of 20 (or less) crystals

The receiver employs two stages of 6AK5 r-f amplification, a 6AK5 converter, three stages of 6AK5 i-f amplification, a 6AL5 detector-AVC tube, a 6BA6 first audio, and a 12AU7 audio output stage in the signal circuits. The heterodyning circuit consists of a 6AK5 crystal oscillator followed by two stages of 6AK5 harminic amplifier. AN 0A2 voltage regulator tube is employed in the receiver to stabilize the deflection sensitivity and gain as a function of line voltage and tube change.

The receiver is designed to be powered from a self-contained dynamotor or 400 cycle a-c transformer and rectifier. The 14 and 28 volt dynamotors are interchangeable with those used with the BC-733D receiver. The a-c supply is mechanically and electrically interchangeable with the dynamotors. Two 6X4 tubes are employed in the full wave rectifier and operate at approximately 55% of maximum current ratings.

1.1.4. ACCESSORIES. - This receiver is always used with a localizer receiver such as the Collins Model 51R. In addition, a suitable power supply, a shockmount such as the Collins 504 3570 001, a cross-pointer meter such as the ID-48 or equivalent (Weston Model 888) and a Collins Model 314U Remote Control Unit will be necessary.

1.2. REFERENCE DATA.

1.2.1. LIST OF MAJOR UNITS AND ACCESSORIES. - The following units are available from the Collins Radio Company to make up a 51V installation:

Collins Type Number	Description	Dimensions	Weight
51V	Glide-Slope Receiver with tubes, less crystals and dynamotors	14-15/16" L 4-7/8" W 7-5/8" H	15 lbs
504 3570 001	Shockmount		2.5 lbs
37P-1	Antenna		

FIGURE 1-2 51V RECEIVER

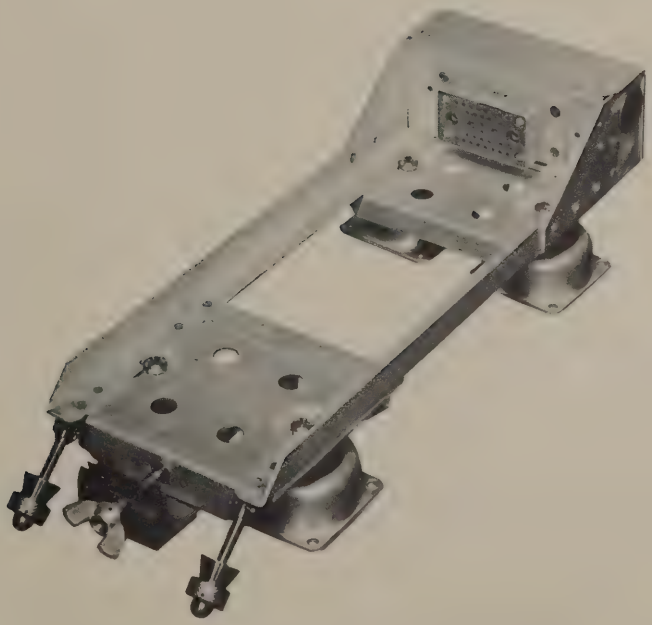


FIGURE 1-3 504 3570 001 SHOCKMOUNT

Collins Type Number	Description	Dimensions	Weight
	Flight path Deviation Indicator type ID-48		1.87 lbs
314U-5	Control Unit		0.7 lbs
314U-6	Control Unit		0.7 lbs
320 2017 00	Rear Power Connector (For Test Bench).		
231 0040 00	Power Supply, 14 volt dc		
231 0041 00	Power Supply, 28 volt dc		
504 6333 003	Power Supply, 115 volt 400 cps ac		
51R	Navigation Receiver		

1.2.2. CONDENSED SPECIFICATIONS.

Basic Function. - To provide glide slope navigation facilities in the frequency range of 329.3 to 335.0 mc.

Receiver Type. - Single conversion superheterodyne.

Indicating System. - Facilities are provided for the tone type glide-slope system. Circuits designed to actuate the vertical deflection pointer and flag arm on Flight Path Deviation Indicator Type ID-48 (Weston Type 888) or equivalent. The indicator circuits are designed to feed a 333 ohm load, consisting of two 1000 ohm ID-48 instruments and one 1000 ohm autopilot takeoff in parallel or equivalent. The circuits also feed two 1000 ohm flag arm movements (on ID-48) in parallel.

Instrumentation. - Flight Path Indicator ID-48 or equivalent. (Weston Model 888).

Remote Control. - Designed to operate from Collins 314U or equivalent, which is standardized navigation frequency selector. Deviation indicator and flag arm may be disabled (receiver turned off), except when localizer frequencies are selected on control unit.

Frequency Coverage. - 329.3 to 335.0 megacycles.

Channels. - Twenty channels, spaced 300 kc apart are provided. A lesser number may be employed.

Selectivity, Overall. -

Total Bandwidth	Attenuation DB
130 kc min.	6
450 kc max.	60

Frequency Stability. - 0.1% under all service conditions. I.E., 0-95% humidity, ±20% battery voltage, temperature from -55° C to +72° C and any altitude to 50,000 feet above sea level.

Undesired Responses. - Attenuation as follows:

Image: 75 db (including antenna)
Adjacent Channel: 75 db
I-F Rejection: 100 db
All Others: 75 db

Radiation. - Radiation from the receiver is negligible; simultaneous parallel operation of receivers on a common antenna permissible without interference.

Sensitivity. - 20 microvolts or less to produce 80 microampere deflection when receiver is adjusted to give 90 microampere deflection with 2 db ratio and 200 microvolt input.

Automatic Gain Control. - Audio output at test jack is uniform within -2 db +0 db from 40 to 100,000 microvolts.

Uniformity of Gain. - Gain on any two channels within 3 db with any setting of the r-f sensitivity control.

Input. - 50 ohms coaxial through UG-58/U connector. Input voltage standing wave ratio 2:1 or less.

Antenna. - Type 37P-1 nose mounted type.

Aural Output. - None.

Harmonic Distortion. - Distortion measured at output test jack less than 5% under conditions of normal sensitivity and carrier input levels of 500 to 10,000 microvolts.

Cross Modulation. - Receiver free from cross modulation effects from adjacent signals 0.6 to 5.7 mc removed, when desired signal strength is 20 microvolts and undesired signal is 5000 microvolts.

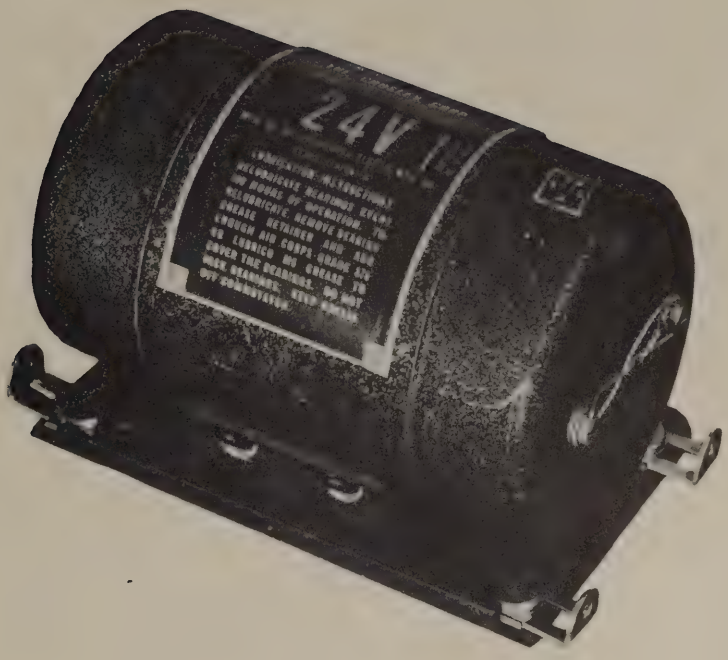


FIGURE 1-4 DYNAMOTOR FOR 51V RECEIVER

FIGURE 1-5 314U-5 & 6 CONTROL UNIT

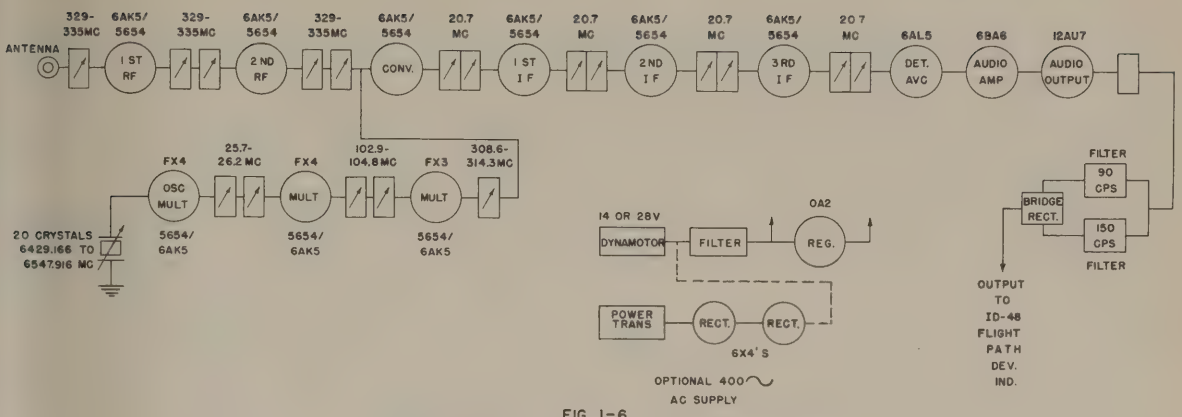


FIG. 1-6
BLOCK DIAGRAM - COLLINS 51V-1 GLIDE SLOPE RECEIVER

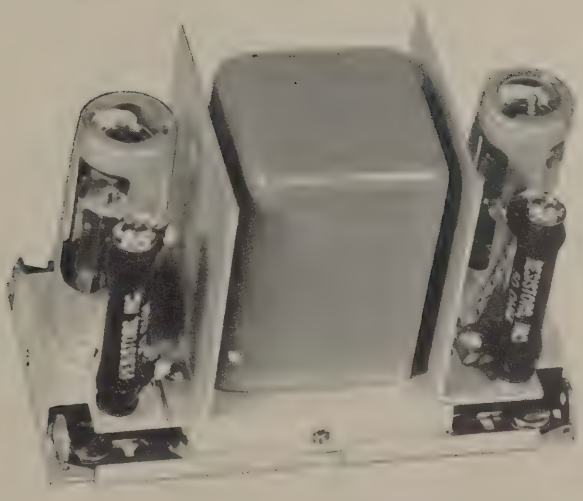


FIGURE 1-7 AC POWER SUPPLY

Course Sensitivity. - Adjustable, normally set for 90 microamperes with 2 db ratio and input of 200 microvolts.

Power Source. - (a) 14 volts dc at 4.25 amps, (b) 28 volts d-c at 2.25 amps, (c) 115 volts, 400 cps at 0.3 amps and 14 volts d-c at 1.8 amps or 28 volts d-c at 1.0 amp.

1.3. VACUUM TUBE COMPLEMENT.

9 - type 5654 (or 6AK5)
1 - type 6AL5
1 - type 6BA6
1 - type 12AU7
1 - type OA2 regulator

Refer to section 6 for table of tube functions and symbol designations.

SECTION 2

INSTALLATION

2.1. INSTALLATION

2.1.1. GENERAL. - Since the 51V receiver requires no adjustment in flight, other than changing crystals (by remote control), it may be located in any convenient place in the aircraft. The interconnecting wires and antenna transmission line should be as short as possible. Carefully bond and shield the aircraft engine ignition system, generator, and accessories to prevent electrical interference with reception.

2.1.2. MOUNTING. - See figure 2-2. Permanently attach the 504 3570 001 shockmount to a flat, rigid surface in the aircraft so that the receiver will be mounted base down in a horizontal position during level flight. The mounting dimensions for the 504 3570 001 are given in figure 2-2. If an MT-28/ARN-5 mounting is to be used, the mounting feet will have to be changed and a set of cleats fastened on the receiver.

Allow sufficient clearance on the top and all sides of the receiver for maximum travel allowed by the shock absorbers, and to permit ready removal and installation of the receiver and associated cords and plugs. TEST JACK, marked on the front panel of the receiver should be readily accessible.

The 51V receiver is secured in the 504 3570 001 mount by setting it on the mount and engaging the extractor mechanism first. After the extractor mechanism has been engaged, turn the wing nut in the clockwise direction until the rear connector is adequately engaged; then, lift the two locks up and set the conical portions on the front angles and turn the thumb nuts clockwise until snug. To remove the receiver, reverse the procedure.

The receiver is secured in the MT-28/ARN-5 mount by setting it in the mount and turning the single thumb screw in a clockwise rotation until snug. Use the fingers to turn the thumb screw, only. Both the mounts have small holes in the locks through which safety wires can be inserted to prevent accidental loosening of the thumb nuts or screws.

2.1.3. CONNECTIONS.

(a) POWER AND CONTROL. - On a new installation, it is suggested that all power and control connections be made at the rear connector. If the receiver is to be installed in place of an R89B Glide Path Receiver, the power connections should be made at the rear and the frequency selector connections at the front in P103.

Short leads are desirable in all circuits and especially in the power circuits. The wires in the control circuits must be number 22 or larger and the wires in the power circuits must be number 18 or larger. The following table lists the pin numbers and the functions of the pins in the two connector plugs (front and rear).

TABLE 2-1

CONTROL AND POWER CONNECTIONS

PIN NO.		FUNCTION
P101	P103	
A1	--	External plate supply
A2	--	+13.25 or 26.5-V d-c input
1	1	Ground
2	2	+26.5 power
3	3	Deviation indicator +
4	4	Deviation indicator -
5	5	Freq. 329.6 *329.9
6	6	Freq. 330.2 *330.5

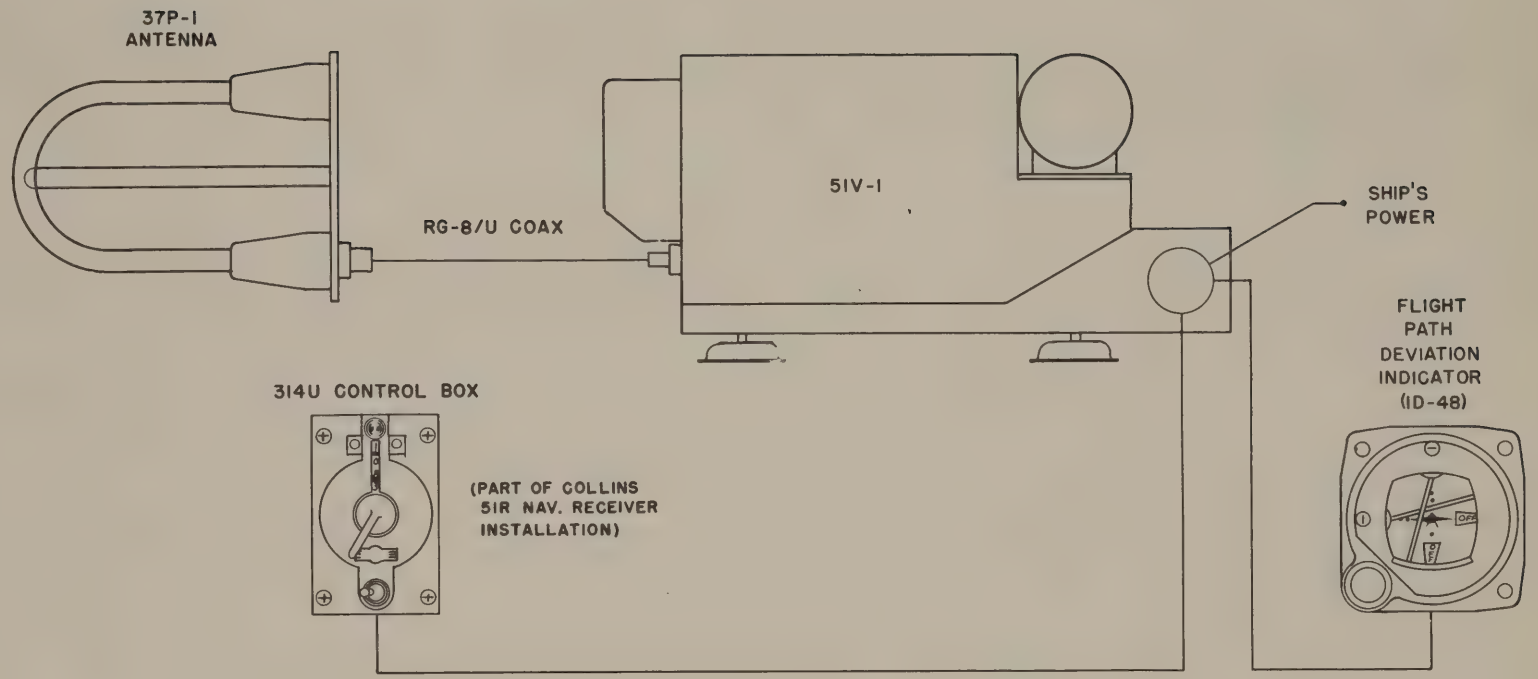
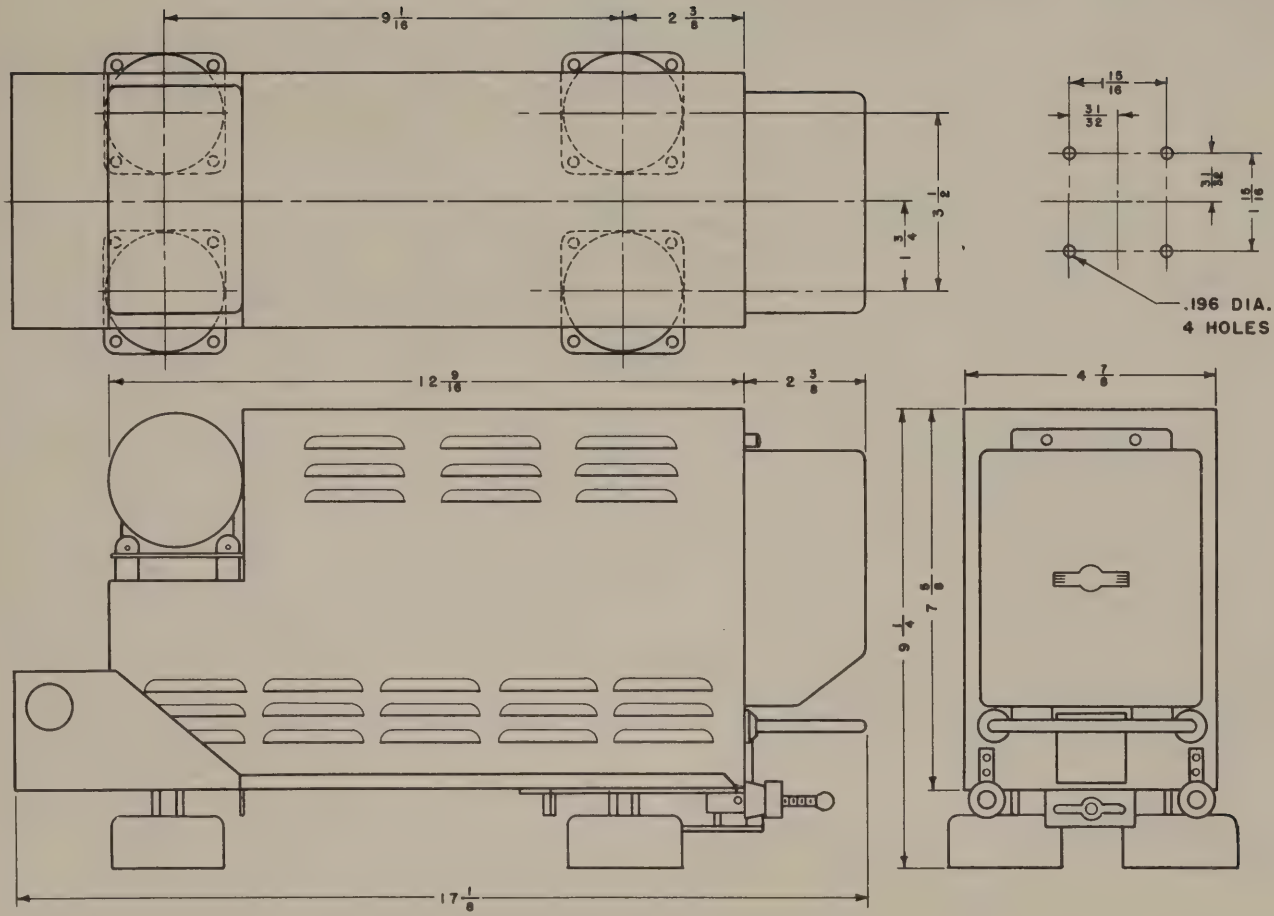


FIG. 2-1

GLIDE SLOPE RECEIVER SYSTEM

Figure 2-1 Glide Slope Receiver System



TYPICAL DRILLING PLAN OF MOUNTING HOLES FOR INSTALLING MOUNTING BASE IN AIRCRAFT

FOR VENTILATION AND VIBRATION CONTROL ALLOW 1" CLEARANCE ON SIDES, 1/2" ON TOP

FIG. 2-2

Figure 2-2 Outline and Installation Details

COMMERCIAL TYPE CONTROL UNIT CRYSTAL PLACEMENT		MILITARY TYPE CONTROL UNIT CRYSTAL PLACEMENT	
10 331.1	11 329.3	10 331.1	11 331.7
9 333.8	12 335.0	9 334.1	12 334.7
8 332.9	13 334.1	8 333.5	13 332.6
7 332.6	14 330.8	7 330.5	14 329.6
6 331.7	15 332.3	6 332.9	15 333.2
5 331.4	16 332.0	5 329.9	16 330.2
4 330.5	17 333.5	4 332.3	17 333.8
3 330.2	18 333.2	3 329.3	18 330.8
2 329.9	19 334.7	2 332.0	19 331.4
1 329.6	20 334.4	1 335.0	20 334.4

Figure 2-3 Crystal Placement

PIN NO. P101	PIN NO. P103	FUNCTION
7	7	Freq. 331.4 *331.7
8	8	Freq. 332.6 *332.9
9	9	Freq. 333.8 *331.1
10	10	Freq. 335.0 *329.3
11	11	Freq. 330.8 *334.1
12	12	Freq. 332.0 *332.3
13	13	Freq. 333.2 *333.5
14	14	Freq. 334.4 *334.7
15	15	+13.5 relay power
16	16	No connection
17	17	Flag alarm -
18	18	Flag alarm +
19	19	Audio
20	-	Frequency AB relay
21		AB relay common
22		On-off relay control
23		On-off relay common
24		115-V 400 cps power or jumper to A2(DC)
25		Spare
26		Spare
27		Spare
28		Spare
29		Spare
30		D-C power through on-off relay

*Not available in R89B installations.

In addition to the plug connections shown above, Jumpers as indicated in the following must be placed in the plug mating with connector P101.

For 26.5 volt operation: Jumper pins 24 to A2. (Apply 26.5 to 2).

For 13.25 volt operation: Jumper pins A2 to 21 and 24, and 1 to 23 ground. (Apply the 13.25 input volts to pin 15)

For a-c operation.

(Apply 115 volts 400 cps to pin 24 and 26.5-V d-c to pin 2)

When using the 51V to replace an R89B receiver, primary relay K112 will not be used; therefore, the 26.5-V input should be made at pin number 2 in P101 which will by-pass the d-c around the relay. A jumper, Collins Part Number 504 5568 001, should be placed between A2 and 30 at the rear plug.

The 314U Control Unit is connected to the 51V receiver as indicated in the following table:

314U Plug Pin No.		P101 in 51V Pin No.	51V Frequency
11	connect to	14	334.4, 334.7
12	connect to	10	335.0, 329.3
13	connect to	5	329.6, 329.9
14	connect to	6	330.2, 330.5
15	connect to	11	330.8, 334.1
16	connect to	7	331.4, 331.7
17	connect to	12	332.0, 332.3
18	connect to	8	332.6, 332.9
19	connect to	13	333.2, 333.5
20	connect to	9	333.8, 331.1
40	connect to	20	— —

In an installation using a 51R-2 Navigation Receiver, the primary power relay K112 can be operated to turn the 51V Glide Slope Receiver on whenever the 51R-2 is in operation on any of the localizer frequencies by connecting pin number 37 on the rear of the 51R-2 to pin number 22 in P101 on the rear of the 51V Receiver. Connected thus, the Glide Slope Receiver will be turned off whenever the 51R-2 is operating on any frequency other than a localizer frequency.

If this feature is not used, the glide slope receiver can be turned on and off by connecting pin 22 in P101 to +26.5V through a suitable on-off switch.

(b) DEVIATION INDICATOR CONNECTIONS. - The 51V Glide Slope Receiver is designed to feed a 333 ohm load consisting of two 1000 ohm ID-38 instruments and one 1000 ohm autopilot takeoff in parallel or equivalent. The circuits also feed two 1000 ohm flag alarm movements or equivalent in parallel.

The instrumentation connections are as follows:

P101 & P103 Pin Numbers	Function	ID-48 Terminal
3	Dev. Ind.	C (+)
4	Dev. Ind.	D (-)
17	Flag Alarm	H (-)
18	Flag Alarm	G (+)

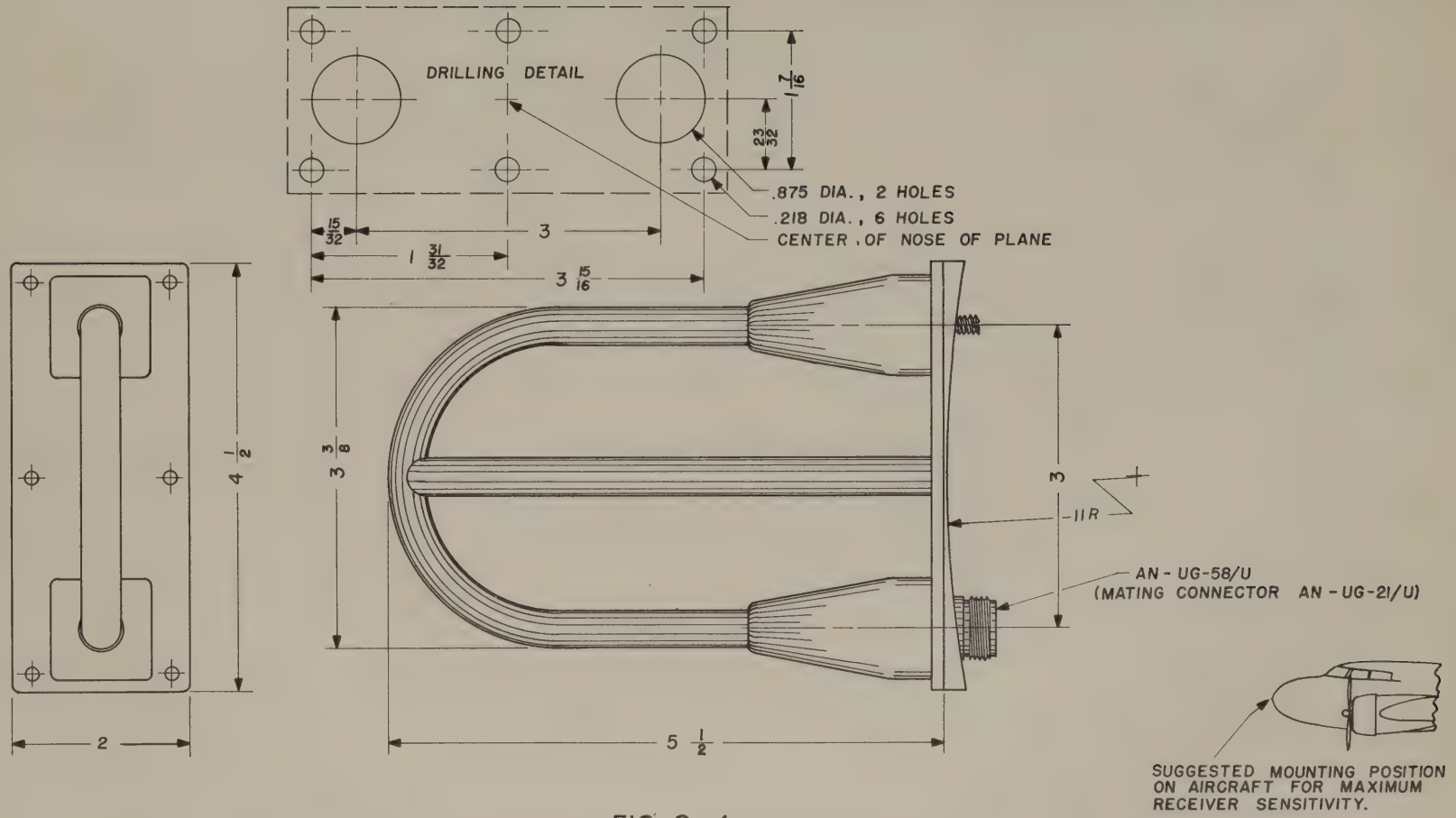


Figure 2-4 37P Antenna

FIG. 2-4

37P-1 ANTENNA

51V-1 WIRING FOR 13.25 V DC
FRONT PLUG OPERATION

FRONT PLUG * PIN NO.	CONNECTED TO
1	Ground
2	No connection
3	Deviation indicator (+)
4	Deviation indicator (-)
5	To wire No. 13 of 314U-5, 6 (329.6)
6	To wire No. 14 of 314U-5, 6 (330.2)
7	To wire No. 16 of 314U-5, 6 (331.4)
8	To wire No. 18 of 314U-5, 6 (332.6)
9	To wire No. 20 of 314U-5, 6 (333.8)
10	To wire No. 12 of 314U-5, 6 (335.0)
11	To wire No. 15 of 314U-5, 6 (330.8)
12	To wire No. 17 of 314U-5, 6 (332.0)
13	To wire No. 19 of 314U-5, 6 (333.2)
14	To wire No. 11 of 314U-5, 6 (334.4)
15	+13.25 V power
16	No connection
17	Flag alarm (-)
18	Flag alarm (+)
19	Audio

Jumper pin A2 to pin 30 at rear plug.

* Same as modified R89B (SK-19-32S).

51V-1 WIRING FOR 26.5 V DC
FRONT PLUG OPERATION

FRONT PLUG * PIN NO.	CONNECTED TO
1	Ground
2	+26.5 V DC power
3	Deviation indicator (+)
4	Deviation indicator (-)
5	To wire No. 13 of 314U-5, 6 (329.6)
6	To wire No. 14 of 314U-5, 6 (330.2)
7	To wire No. 16 of 314U-5, 6 (331.4)
8	To wire No. 18 of 314U-5, 6 (332.6)
9	To wire No. 20 of 314U-5, 6 (333.8)
10	To wire No. 12 of 314U-5, 6 (335.0)
11	To wire No. 15 of 314U-5, 6 (330.8)
12	To wire No. 17 of 314U-5, 6 (332.0)
13	To wire No. 19 of 314U-5, 6 (333.2)
14	To wire No. 11 of 314U-5, 6 (334.4)
15	No connection
16	No connection
17	Flag alarm (-)
18	Flag alarm (+)
19	Audio

Jumper pin A2 to pin 30 at rear plug.

* Same as modified R-89B (SK-19-32S).

51V-1 WIRING FOR 13.25 V DC
REAR PLUG OPERATION

REAR PLUG PIN NO.	CONNECTED TO
A1	No connection
A2	Jumper to pins 21 and 24
1	Ground & jumper to pin 23
2	No connection
3	Deviation indicator (+)
4	Deviation indicator (-)
5	To wire No. 13 of 314U-5, 6 (329.6, 329.9 mc)
6	To wire No. 14 of 314U-5, 6 (330.2, 330.5 mc)
7	To wire No. 16 of 314U-5, 6 (331.4, 331.7 mc)
8	To wire No. 18 of 314U-5, 6 (332.6, 332.9 mc)
9	To wire No. 20 of 314U-5, 6 (333.8, 331.1 mc)
10	To wire No. 12 of 314U-5, 6 (335.0, 329.3 mc)
11	To wire No. 15 of 314U-5, 6 (330.8, 334.1 mc)
12	To wire No. 17 of 314U-5, 6 (332.0, 332.3 mc)
13	To wire No. 19 of 314U-5, 6 (333.2, 333.5 mc)
14	To wire No. 11 of 314U-5, 6 (334.4, 334.7 mc)
15	+13.25 v DC power
16	No connection
17	Flag alarm (-)
18	Flag alarm (+)
19	Audio
20	To wire No. 40 of 314U-5, 6 (A-B relay)
21	Jumper to pin A2 and 24
22	To wire No. 37 on 51R-1* or 51R-2 Navigation Receiver, or +13.25 V DC Pin 15 (thru dynamotor on-off switch if required).
23	Jumper to pin 1
24	Jumper to pin A2 and 21
25	No connection
26	No connection
27	No connection
28	No connection
29	No connection
30	No connection

* See 51R-1 Service Bulletin No. 12

51V-1 WIRING FOR 26.5 V DC REAR PLUG OPERATION

REAR PLUG PIN NO.	CONNECTIONS
A1	No connection
A2	Jumper to pin 24
1	Ground
2	+26.5 V DC power
3	Deviation indicator (+)
4	Deviation indicator (-)
5	To wire No. 13 of 314U-5, 6 (329.6, 329.9 mc)
6	To wire No. 14 of 314U-5, 6 (330.2, 330.5 mc)
7	To wire No. 16 of 314U-5, 6 (331.4, 331.7 mc)
8	To wire No. 18 of 314U-5, 6 (332.6, 332.9 mc)
9	To wire No. 20 of 314U-5, 6 (333.8, 331.1 mc)
10	To wire No. 12 of 314U-5, 6 (335.0, 329.3 mc)
11	To wire No. 15 of 314U-5, 6 (330.8, 334.1 mc)
12	To wire No. 17 of 314U-5, 6 (332.0, 332.3 mc)
13	To wire No. 19 of 314U-5, 6 (333.2, 333.5 mc)
14	To wire No. 11 of 314U-5, 6 (334.4, 334.7 mc)
15	No connection
16	No connection
17	Flag alarm (-)
18	Flag alarm (+)
19	Audio
20	To wire No. 40 of 314U-5, 6 (A-B relay)
21	No connection
22	To pin No. 37 of 51R-1* or 51R-2 Navigation Receiver or to +26.5 V DC Pin 2 (thru dynamotor on-off switch, if required)
23	No connection
24	Jumper to A2
25	No connection
26	No connection
27	No connection
28	No connection
29	No connection
30	No connection

* See 51R-1 Service Bulletin No. 12.

51V-1 WIRING FOR 26.5 V DC AND 115 V 400 CPS AC - REAR PLUG OPERATION

REAR PLUG PIN NO.	CONNECTIONS
A1	No connection
A2	No connection
1	Ground
2	+26.5 V DC power
3	Deviation indicator (+)
4	Deviation indicator (-)
5	To wire No. 13 of 314U-5, 6 (329.6, 329.9 mc)
6	To wire No. 14 of 314U-5, 6 (330.2, 330.5 mc)
7	To wire No. 16 of 314U-5, 6 (331.4, 331.7 mc)
8	To wire No. 18 of 314U-5, 6 (332.6, 332.9 mc)
9	To wire No. 20 of 314U-5, 6 (333.8, 331.1 mc)
10	To wire No. 12 of 314U-5, 6 (335.0, 329.3 mc)
11	To wire No. 15 of 314U-5, 6 (330.8, 334.1 mc)
12	To wire No. 17 of 314U-5, 6 (332.0, 332.3 mc)
13	To wire No. 19 of 314U-5, 6 (333.2, 333.5 mc)
14	To wire No. 11 of 314U-5, 6 (334.4, 334.7 mc)
15	No connection
16	No connection
17	Flag alarm (-)
18	Flag alarm (+)
19	Audio
20	To wire No. 40 of 314U-5, 6 (A-B relay)
21	No connection
22	To pin No. 37 of 51R-1* or 51R-2 Navigation Receiver or to +26.5 V DC, pin 2 (thru dynamotor on-off switch, if required).
23	No connection
24	115 V 400 cps AC input
25	No connection
26	No connection
27	No connection
28	No connection
29	No connection
30	No connection

* See 51R-1 Service Bulletin No. 12.

(c) ANTENNA CONNECTIONS. - The Collins Type 37P antenna is recommended for use with the 51V Glide Slope Receiver. See figure 2-4 for installation details of the 37P antenna. The 37P was designed to mount horizontally $\pm 30^{\circ}$ on the nose of the aircraft with its 52 ohm coaxial receptacle protruding through the mounting surface inside the skin of the ship. Both the receiver and the antenna are equipped with AN-UG-58/U receptacles which take AN-UG-21/U mating connector plugs. RG-8/U coaxial cable should be used between the receiver and antenna. The transmission line should be as short and direct as possible and any bends in the line should be gradual. There should be enough slack in the line to allow free movement of the receiver on its shockmount.

2.1.4. CRYSTAL PLACEMENT. - The receiver is shipped with the crystals placed for commercial operation. Refer to figure 2-3 for placement of crystals for both commercial and military use. The crystal cover plate should be removed and the placement of the crystals checked before the unit is placed in service.

SECTION 3

ADJUSTMENT AND OPERATION

3.1. ADJUSTMENT:

3.1.1. GENERAL. - The tuning, balance, and sensitivity adjustment controls located inside the 51V receiver should not be changed except by qualified trained personnel at properly equipped repair shops. These are primarily manufacturing adjustments, and no readjustment should be required unless repairs are made on the receiver.

3.1.2. OPERATION CHECKS. - After installation and before operation of the equipment under service conditions, the receiver should be checked for sensitivity and instrument operation. If possible, all 20 channels should be checked for sensitivity.

The sensitivity check should be made with the receiver coupled to the signal generator through a shielded line. The signal generator should be well shielded and the battery voltage to the receiver should be maintained at 26.5-V. A receiver sensitivity of better than 20 microvolts for a deflection of 80 microamperes with a 2 db off-course signal should be obtained.

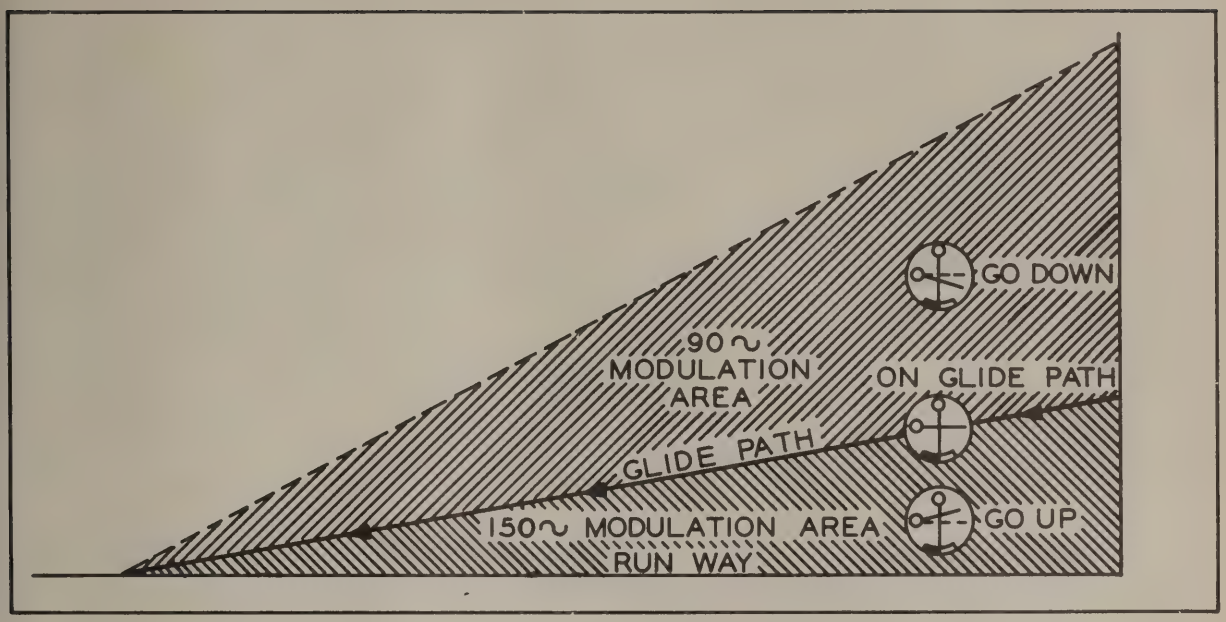


Figure 3-1 Glide Slope Chart

The instrument check can be made by using the signal generator as a transmitter by setting it in front of the aircraft and attaching a suitable antenna to the signal generator output and putting it parallel to and at about the same height as the receiver antenna, which must be coupled back up to the receiver. A 90 and 150 cycle source for modulating the signal generator must be available. With both the receiver and the signal generator turned on (no modulation), select identical frequencies in both units and turn the signal generator output control to full-on position. Adjust the signal generator output or the spacing between the aircraft and the signal generator antenna until the flag alarm on the horizontal needle no longer covers the end of the needle. Turn the 90 cycle modulation on. The signal should cause the needle to move downward. Turn the 90 cycle modulation off and turn the 150 cycle modulation on; the signal should now cause the needle to move upward.

3.2. OPERATION.

3.2.1. PROCEDURE.

(a) Turn the frequency selector dial of the associated 51R navigation receiver to the desired localizer frequency to turn the equipment ON. If the 51V Glide Path Receiver is used separately, turn the associated power switch to the ON position.

(b) If not part of a 51R Navigation System, select the proper glide slope frequency.

(c) Observe course indications on ID-48. The horizontal needle on each ID-48 Indicator provides vertical guidance during landing operations. The glide slope or path is an imaginary beam created by the combined operation of the vertical and lateral guidance transmitters which runs from the landing spot on the field at a specified angle up into the air as far as the radiated signals will reach. When the aircraft is headed toward the runway during a landing operation, the action of the horizontal needle is directional, that is, when the needle is above center, the aircraft must be flown up to regain the center of the glide slope and vice versa.

(d) Upon landing, if the equipment is part of a 51R Navigation System, the entire system should be turned off by means of the system circuit-breaker; otherwise turn the 51V receiver off by means of an associated power switch.

3.2.2. INDICATIONS OF FALSE OPERATION. - If the associated glide slope transmitting equipment fails to send out signals or if a failure of the glide slope receiver occurs, the automatic alarm circuit in the receiver will cause the flag to cover the end of the horizontal needle regardless of the position of the aircraft.

3.2.3. GLIDE PATH. - Figure 3-1 depicts the glide path which radiates from the glide path transmitter located on the ground adjacent to the landing strip.

Also shown in figure 3-1 are the indicator's horizontal needle positions and the significance of these positions to the pilot. It is evident that the aircraft's heading should follow the direction indicated by the needle.

SECTION 4

CIRCUIT DESCRIPTION

4.1. GENERAL.

4.1.1. PURPOSE OF EQUIPMENT. - Radio Receiving Equipment 51V-1 is an airborne equipment designed to give vertical guidance to a pilot during aircraft landing operations. The equipment is used with the Model 51R Receiver to give both vertical and lateral instrument approach.

4.1.2. FUNCTION OF EQUIPMENT. - The function of the equipment is; (a) the reception of the uhf carrier simultaneously amplitude modulated at 90 and 150 cps, and (b) the conversion of these two audio frequencies into separate direct currents. The difference in magnitude between the two currents thus produced can then be measured on a microammeter. If one of the two audio frequencies is predominant in the received modulated carrier that frequency will produce the greater output current. The difference in output currents will then cause the meter needle to deflect from zero in a direction that depends upon which of the two frequencies is predominant. If equal amounts of the two audio frequencies are received in the modulated carrier, then equal amounts of output currents will be produced, no difference will exist, and no meter needle deflection will result.

4.2. ELECTRICAL DESCRIPTION.

4.2.1. PRIMARY POWER AND CONTROL CIRCUITS.

(a) PRIMARY POWER CIRCUITS. - 26.5 volts d-c is applied to the filaments of the tubes and one side of the crystal selector relay coils when the 26.5 volts source is connected to terminal number 2 in P-101. 26.5 volts is applied to the primary of the dynamotor when primary relay K-112 is operated. Primary relay K-112 is usually operated when the associated localizer receiver is tuned to a channel in the 108-111.9 mc spectrum. In some installations a

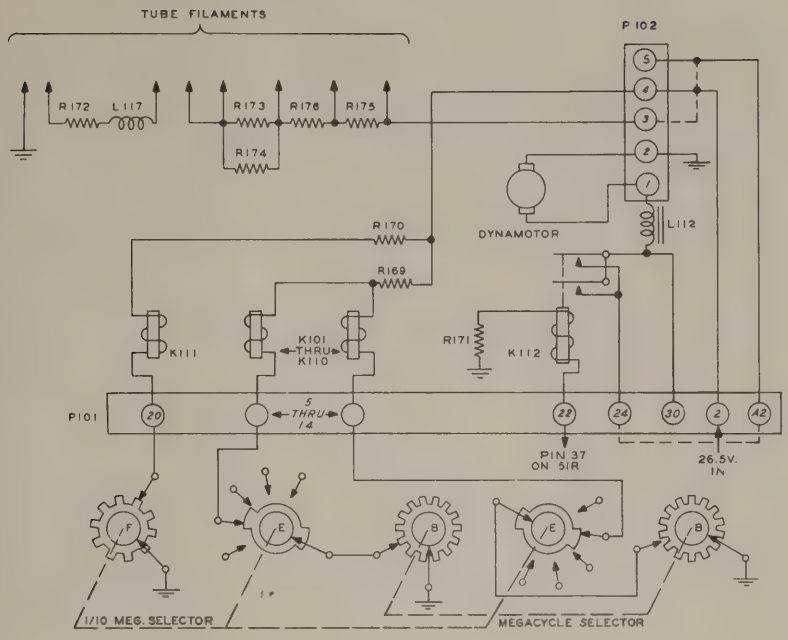


Figure 4-1 Primary Power Circuits for 26.5-V Operation

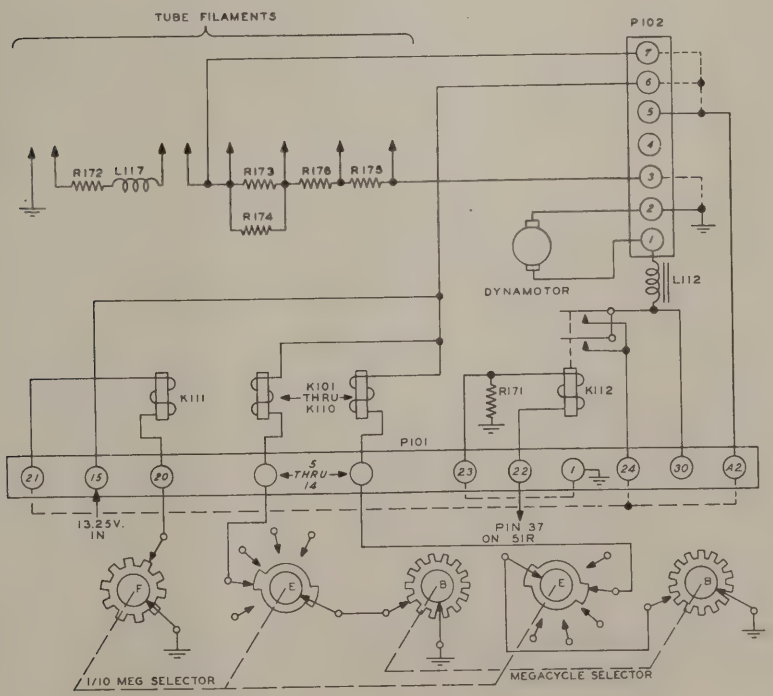


Figure 4-2 Primary Power Circuits for 13.25-V Operation

separate plate power switch may be employed. The primary power source is connected to terminal 2 and ground (terminal 1). When connected for 26.5 volt d-c operation, the power for operating the dynamotor flows from terminal 2 on P-101 to terminal 4 of dynamotor receptacle P-102 which is jumpered to terminal 5 on this same receptacle in the dynamotor plug; from terminal 5 of P-102 the circuit goes to terminal A2 of P-101 (which is jumpered to terminal 24) and then through the contacts of relay K-112 and choke L-112 to terminal 1 of P-102 and the primary of the dynamotor.

The tube filaments are energized immediately upon applying 26.5 volts to terminal 2 of P-101 by means of the circuit from this terminal to terminal 4 of P-102 which is jumpered to terminal 3 of P-102 to which the filament string is attached.

Primary relay K-112 is energized by a 26.5 volt d-c source from pin 37 on the Type 51R-2 receiver through the coil of this relay and dropping resistor R-171 to ground. The crystal selector relays K-101 thru K-110 are energized by the circuit from terminal 2 of P-101 to terminal 4 of P-102, through resistor R-169, the coils of the relays, and the frequency selecting switches in the Type 314U control to ground. Relay K-111 is energized by the circuit from terminal 2 of P101 to terminal 4 of P-102 through R-170, the coil of relay K-111, and the frequency selector switches in the Type 314U control to ground.

Refer to figure 4-2. When the primary source is 13.25 volts, Dynamotor DM-52-AZ is employed and the positive terminal of the battery is connected to terminal 15 of P-101. The plate power dynamotor is energized by the circuit from terminal 15 to terminal six on P-102 (which is jumpered to terminal 5 of P-102). From terminal 5 of P-102 the circuit goes to terminals A2 and 24 of P-101 and from there to the contacts of plate relay K-112, through L-112, and to the dynamotor.

The coil of plate relay K-112 is energized by the circuit from a 13.25 volt source in the associated 51R receiver (pin 37) to terminal 22 of P-101, through the coil of relay K-112, to terminal 23 of P-101 which is jumpered to terminal 1 (ground).

When using a 13.25 volt primary source, the relay dropping resistors are not used; the circuit for operating the crystal relays K-101 thru K-110 going from pin 15 of P-101 through the relay coils and the selector switches in the control box to ground. The circuit for energizing relay K-111 is from terminal 15 of P-101 to terminals 6 and 5 of P-102, to terminal A2 of P-101, which is jumpered to terminal 21; from there the circuit is completed through the coil of relay K-111 to the frequency selecting switches in the control box to ground.

Refer to figure 4-3. When a 115 volt 400 cps a-c source is used for plate primary excitation, the 115 volt source is connected between terminal 24 of P-101 and ground (terminal 1). The circuit for exciting

the primary of the plate transformer is from terminal 24 of P-101 through the contacts of relay K-112, through L-112 to terminal 1 of P-102 and one end of the primary of the transformer. The other end of the primary of the transformer is connected to ground through terminal 2 of P-102.

The relays and tube filaments are usually supplied with 26.5 volts d-c in such an installation, therefore, the crystal relays are energized by a circuit from a 26.5 volt source applied to terminal 2 of P-101 through resistor R-169, through the coils of the relays, and through the frequency selector switches in the control box to ground. Relay K-111 is energized from the same source at terminal 2 of P-101 through resistor R-170, the coil of relay K-111 and the frequency switches in the control box to ground.

The tube filaments, along with current equalizing resistors R-173, R-174, and R-175, are connected in a series-parallel circuit. The entire filament string is connected in series for 26.5 volt operation with one end connected to the 26.5 volt source at terminal 3 of P-102 and the other end connected to ground. For 13.25 volt operation, the two outer ends of the filament string are grounded and the 13.25 volts are supplied to the electrical center of the string from terminal 7 of P-102. For a-c operation, the filaments are connected as for 26.5 v operation since the filaments are excited from a 26.5 volt d-c source in a-c operation.

(b) CONTROL CIRCUITS. - Refer to figure 4-4. Relay K-112, which is used to turn the equipment on, is operated by a switch in the 51R equipment which turns the receiver on only when the 51R is tuned to a frequency that is normally used for localizer service (108 to 111.9 mc). If this receiver is used with equipments other than the 51R system, a separate on-off switch will probably be used; in either case, the object of the on-off switch is to supply 26.5 or 13.25 V d-c to one end of the coil on power relay, K-112 thru terminal 22 of P-101 since the other end of the coil is grounded.

The crystal select relay coils are also connected to d-c and are operated by grounding one end of the coils. Parts of switch sections B, E and F in control box 314U-5 & 6 are used to perform these grounding operations.

Glide slope frequency allocations are such that a certain glide slope frequency is paired up with each localizer frequency in the localizer frequency spectrum (the localizer frequencies being 100 kc apart in the range 108 to 119.9 mc). The glide slope frequencies are repeated every 2 mc throughout the localizer frequency band; that is, 108.1 mc and 110.1 and so on will have the same glide slope frequency of 334.4 mc. With this system, 20 glide slope frequencies are necessary. These 20 frequencies, to be repeated every two megacycles, are obtained by selecting one of 20 crystals by means of the 314U Control Unit. All twenty crystals can be successively used by sweeping the 1/10 mc control on the 314U control box through its 180 degree excursion twice, once for an even mc setting of the megacycle positioner on the 314U (such as 108 mc) and once for an odd setting of the megacycle positioner on the 314U (such as 109 mc). The 20 cyrstals are selected with 11 relays, 10 of which each select two crystals while the 11th selects the desired crystal from these two.

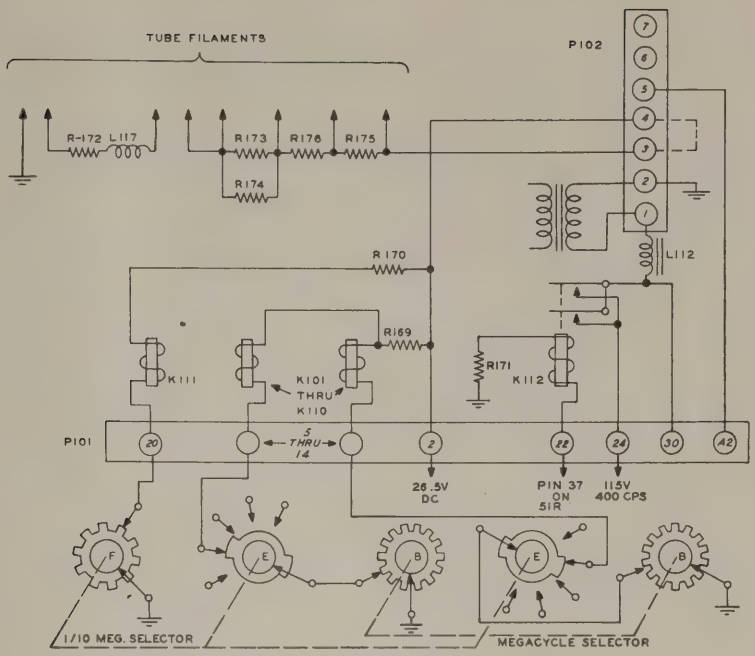


Figure 4-3 Primary Power Circuits for A-C Operation

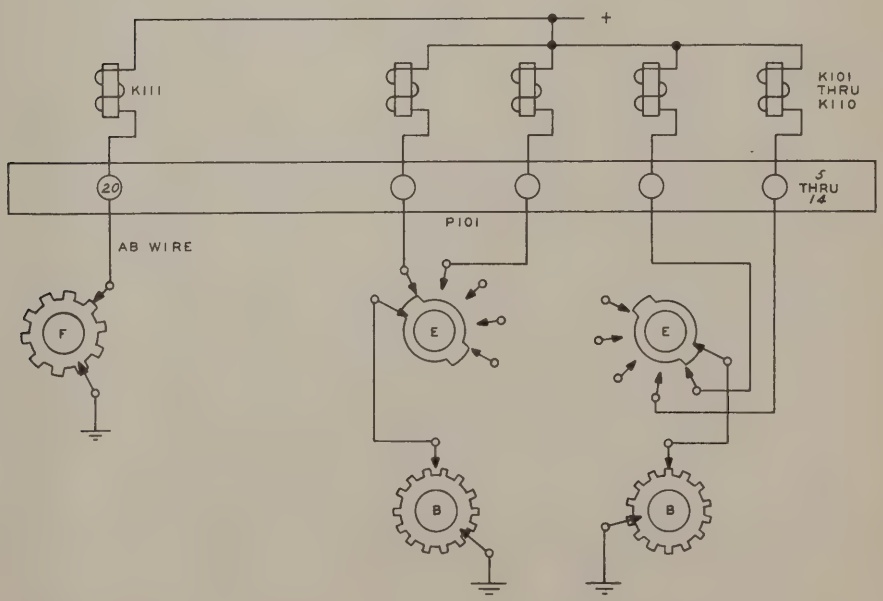


Figure 4-4 Control Circuits

See figure 5-5. The 314U switches concerned with the selection of 51V frequencies function in the following manner: In 180 degrees of rotation (ten positions), switch section E energizes one crystal relay from two groups of five crystal relays. This relay is held operated for two positions of switch section E due to the wide blade on the rotors of section E. Each relay connects two crystals through to relay K-111 which is operated by section F of the switch. Section F, due to its construction, alternately energizes and de-energizes relay K-111 as the frequency selector switch is rotated to the succeeding positions. Switch section B determines which group of five crystal selector relays will be used. Relays K-107, K-110, K-106, K-101 and K-102 are used when the 51R receiver is tuned to any frequency between 108 and 108.9 mc and relays K-105, K-103, K-108, K-104 and K-109 are used when the 51R localizer receiver is tuned to frequencies between 109 and 109.9 mc. Refer to the MAINTENANCE section of this book for a correlation of glide slope and localizer frequencies.

4.2.2. RADIO FREQUENCY CIRCUITS. - Refer to figure 5-4. The receiver employs a 6AK5 miniature tube in the first r-f amplifier stage. The grid circuit of this stage is fixed tuned to the frequency range 329.3 to 335.0 mc by means of C101. The signal is introduced to the receiver by tapping the antenna on the grid coil of the first stage. Conventional parallel tuning is employed in the grid of this stage while series tuning is employed in the plate circuit. The plate circuit is magnetically coupled to the grid circuit of the second r-f amplifier tube which is also a type 6AK5 tube. Series tuning is employed in both the grid and the plate circuits of this tube. The plate circuit of the second r-f tube is magnetically coupled to the grid circuit of the converter tube V103 which is a 6AK5 tube also. The converter stage employs control grid injection. AVC voltage is applied to the control grids of the two r-f tubes through series resistors. The plate circuit of the converter tube is magnetically coupled to the grid of the first i-f tube through i-f transformer T-101.

4.2.3. HETERODYNING SIGNAL CIRCUITS. - The heterodyning signal (injection voltage) is obtained with the use of quartz crystals operating at comparatively low frequencies (approx. 6.4 to 8.8 mc) for stability followed by a series of frequency multipliers. The crystal oscillator tube is a type 6AK5 whose grid and screen circuit operates in the fundamental frequency region of the crystals. The plate circuit of the crystal oscillator stage is used to multiply the frequency three or four times. The oscillating portion of the crystal stage requires no tuning, feedback voltage being developed across the cathode choke L-119. The output of the oscillator stage at three or four times crystal frequency is magnetically coupled to the grid of the first multiplier tube V-111. (Magnetic coupling is used between all stages in the injection voltage generator circuit so that uniform injection to the converter is obtained as well as to suppress undesired harmonic multiples of the crystal frequency at the converter). The first multiplier tube is a 6AK5 miniature pentode whose grid is tuned to three or four times crystal frequency and whose plate is tuned to 12 or 16 times crystal frequency. The last frequency multiplier tube, V-112, is a 6AK5

also in which frequency tripling takes place to produce an output frequency of 36 or 48 times the original crystal frequency. Series tuning is employed in the plate circuit of this stage. The desired value of injection voltage is obtained from the low potential end of coil L-110 through capacitor C-115.

4.2.4. INTERMEDIATE FREQUENCY AMPLIFIERS. - The i-f system employs four transformers and three amplifier tubes (all type 6AK5) to obtain the requisite gain and selectivity. The i-f transformers are carefully temperature compensated and have less than critical coupling. This enables the i-f system to be tuned by the conventional peaking technique. The tuning cores have grounded slugs so that an ordinary metal screwdriver may be used to tune the transformers. The i-f system is tuned to 20.7 mc and feeds the detector and AVC rectifier circuits.

4.2.5. DETECTOR AND AUTOMATIC VOLUME CONTROL CIRCUITS. - A single dual diode tube, a type 6AL5, performs the duties of detector and AVC rectifier. The AVC rectifier is connected in such a fashion as to serve as a voltage doubler to the detector diode. This permits a high value of delay voltage to be employed in the AVC system without having a very high level at the detector diode. The AVC is applied to two r-f stages and three i-f stages. A small additional amount of AVC is impressed on the first audio amplifier grid to obtain a slightly negative slope to the output vs input characteristics of the receiver. The detector output is taken from the diode load at the junction of resistors R-126 and R-127 and coupled to the grid of the first audio stage through capacitors C-141 and C-139. A small value of positive voltage is applied to the cathode of the detector portion of V-107 to cause sufficient delay in the AVC action to permit the receiver to be at maximum sensitivity on weaker signals.

4.2.6. AUDIO AMPLIFIERS. - Two stages of audio amplification is employed in the 51V receiver, namely, a type 6BA6 first audio amplifier and a type 12AU7 output stage. The first audio stage has AVC voltage applied to the control grid with the result that a slightly negative slope to the output vs input characteristics is obtained. This is useful in that it dampens the swing of the glide slope indicator and prevents a rapid fluctuation of the needle as the aircraft approaches the landing field. The value of negative slope produced by the AVC voltage on the grid of V-108 is adjustable by means of R-131 in the cathode circuit of this tube. The value of slope decreases with an increase in cathode resistance due to the cancelling effect additional cathode bias has on the action of the AVC voltage. This control as well as R-133, the audio volume control, is set at the factory and usually needs no further attention.

The audio output stage consists of a type 12AU7 dual triode in a push-pull circuit. The grid of the first section of this tube is exciter from the plate circuit of V-108 through C-143 while the grid of the second section of this tube is excited by the voltage drop produced across R-139 in the common cathode circuit. The plates of the output tube are impedance coupled to the 90 and 150 cycle filters.

The filters feed the double bridge rectifier in conventional fashion.

4.2.7. FILTER NETWORK. - The filter network consists of Z-101 and Z-102. One side of the audio amplifier connects to the center arm of the balance control R-161 which in turn regulates the relative amount of 90 and 150 cycle voltages introduced into the filters.

4.2.8. BALANCED BRIDGE CIRCUIT. - The varistor (copper oxide rectifier) in the balanced bridge circuit is connected to the output of the filters Z-101 and Z-102. Varistor E-101 in the balanced bridge circuit is fed equal 90 and 150 cycle voltages from the output of the filters (when the received signal is modulated with equal 90 and 150 cycle voltages). The varistor rectifies and produces equal amounts of d-c voltages of opposite polarity, thus producing zero reading when the varistor output is connected to the visual indicator.

4.2.9. FLAG ALARM CIRCUIT. - The common current of the two balanced rectifiers flows through the flag alarm movement, resulting in this movement being pulled down whenever adequate signal currents are present in the metering circuits. Failure of the signal will allow the spring return movement to lift the flag into view thus obscuring the end of the vertical needle and showing the pilot that further use of the facility is dangerous due to lack of signal.

4.2.10. VOLTAGE REGULATOR CIRCUIT. - A voltage regulator tube is employed in the receiver to stabilize the deflection sensitivity and gain as a function of line voltage and tube change. The AVC delay in the detector circuit, the r-f and i-f screen circuits and the variable gain audio stage are all supplied from this tube.

4.2.11. POWER SUPPLIES. - The receiver is designed to be powered from a self-contained dynamotor or 400 cycle a-c transformer and rectifier. The 14 or 28 volt dynamotors are interchangeable with those used with the BC-733D receiver. Sufficient filter for either power supply is included as part of the receiver assembly. Additional hash filter is mounted in the dynamotor power supplies. The a-c power supply is mechanically and electrically interchangeable with the dynamotors thereby providing an optional system which requires no rotating machinery. Two 6X4 tubes are employed in the full wave rectifier and operate at approximately 55% of maximum current ratings.

SECTION 5

MAINTENANCE

5.1. PREFLIGHT INSPECTION.

NOTE

Connect an external power supply to the aircraft before making extensive tests when the engine is not running. Otherwise tests should be of extremely short duration.

5.1.1. VISUAL INSPECTION. -

(a) Check antenna to see that it has not been bent and is free from cracks.

(b) Check the shock links on antenna and receiver for evidence of worn rubber.

(c) Check the mountings of antenna and receiver noting that the mountings themselves are in good condition and that they are securely fastened to the aircraft.

(d) Check the cable connections, making sure the plugs are free from corrosion and secured correctly. Tighten the knurled ring on the plugs.

(e) Check the dynamotor to see that it is securely fastened to the receiver.

(f) Check the mechanical operation of the frequency selector switch on the Control box.

5.1.2. OPERATIONAL CHECK. - Turn on the receiver. Plug a headset into the receiver test jack and listen for the 90 and 150 cycle modulation of a near-by transmitter. If no suitable signal is available, listen for tube hiss. At the same time note whether or not Indicator ID-48 shows an indication. (If no transmitter signal is present, the indicator flag alarm should cover the tip of the needle.)

5.2. 100 HOUR INSPECTION.

5.2.1. GENERAL. -

(a) Inspect all cables and their bonding. Also, inspect the connections of the antenna for good clean contact.

(b) Measure battery voltage to ground. Normal operating voltages are from 23.8 to 31.8 volts for 28 volt installation, 11.9 to 15.9 volts for 14 volt installation. Check the a-c supply voltage in a-c installations as well as the associated d-c voltage. The a-c voltage should be 103.5 to 126.5 volts.

(c) Inspect for possible shorts and loose connections which may be caused by prolonged vibration.

(d) Check for microphonics and loose connections by listening with the headset at the test jack; tap the individual tubes and the receiver during the process.

(e) Check the tubes in a tube tester and replace all weak tubes.

(f) Measure the r-f sensitivity. Refer to paragraph 5.3.2.(h) for sensitivity measurement.

(g) Make the preflight inspection for inspections not specifically mentioned in this check.

5.3. TROUBLE SHOOTING.

5.3.1. TROUBLE SHOOTING IN INSTALLED EQUIPMENT. -

(a) EQUIPMENT INOPERATIVE. - If the equipment is completely inoperative, determine if the supply voltage is reaching the receiver. If necessary, the voltage can be checked at the rear connector plug. Look for open wiring, poor connection of plugs and faulty switches or an open fuse. If voltage exists at the receiver, check for dead tubes, faulty crystal or shunted or open antenna connection. Plug in the headset and listen for tube hiss. Jar the receiver by hand. If it is still inoperative, remove it from the airplane for a bench test.

(b) EQUIPMENT NOISY. - If the equipment is operating but noisy, try to determine if the noise is due to atmospherics, noise originating in the airplane from generators and ignition, or from a source within the receiver itself. With little experience, it is not too difficult to distinguish between these by listening in the headset.

(1) Atmospherics (static) are not usually prevalent in receivers operating at frequencies as high as 200 megacycles. However interference due to corona, diathermy machines, and other industrial equipment may be present and may be identified in the headsets with the engines not running. Disconnecting the antenna transmission line should eliminate or at least greatly reduce the noise if it is originating from one of these sources outside of the receiver.

(2) Ignition noise may be identified on the ground and should appear immediately upon the starting of the engine.

(3) If the source of noise cannot be traced to either (1) or (2), check the receiver and its connecting cables. Check all cable connections and ground for good contact. Check the tubes in the receiver for internal noise or howl. Jar the receiver by hand in seeking intermittent contacts.

(c) EQUIPMENT INSENSITIVE. - If the receiver is operative but insensitive, check the primary voltage at the junction box or rear plug. If the voltage is normal, check tubes by replacing one at a time, carefully noting any change in sensitivity as they are replaced. Check the antenna system for an open wire or short. If no obvious defect is found, remove the receiver from the airplane for bench check. Do not attempt to align the receiver without the necessary equipment. Alignment procedures are given in Paragraph 5.3.2.

5.3.2. TROUBLE SHOOTING ON TEST BENCH. - No one but competent test personnel with proper test equipment should be allowed to service this equipment. In the majority of the cases of failure, the cause can be traced to some relatively simple defect, however, alignment of the receiver demands full understanding of test procedures and test equipment. In trouble shooting the equipment, the voltage and resistance tables at the end of this section will be useful.

(a) DEFINITIONS.

On-Course Signal: A glide slope r-f signal is simultaneously modulated 40% at 90 cps and 40% at 150 cps.

Standard Off-Course Signal: Same as on-course signal except the modulating 90 and 150 cps voltages are adjusted to a 2 db ratio. A decreased 90 cps or an increased 150 cps modulated r-f signal shall make the flight path indicator deflect upward.

Standard Course Selectivity: A 65 uA indicator deflection for a standard off-course signal input of 500 uV.

Course Width: The indicator deflection in uA with a standard off-course signal of 500 uV.

Course Stability: The ability of the receiver to give an on-course indication with an on-course signal under various conditions of operation. Course stability is measured in uA deflection from an on-course indication.

(b) TEST EQUIPMENT

(1) 28 volt dc source. Voltmeter to indicate 26.5 ± 0.5 volts.

(2) 314U Remote Control Unit calibrated in glide slope frequencies. Test cable and plug, off-on power switch, test, deflection, and flag alarm circuit connections.

(3) I-F signal generator such as GR805C, Measurements 65B, Measurements 80, or Boonton 212A.

(4) Crystal frequency spotter for 20.7 mc. (Not needed if Boonton 212A test set is used).

(5) R-F signal generator such as the Boonton 212A Univerter Test Set used with the Boonton 211A Signal generator for 329.3 - 335 mc R.F. signal. This test set can be used for the i-f generator also.

(6) Course generator such as the 479S or equivalent for 90 and 150 cps a-f signal modulation. On-course signal 40% modulation each 90 and 150 cps. Off-course signal same as on-course with one a-f tone 1 db down and the other tone 1 db up from 40% modulation.

(7) Deflection indicator meter, 100-0-100 uA or 150-0-150 uA meter with total resistance of 1000 ohm shunted by 500 ohms to present a 333 ohm ±2% load to the receiver.

(8) Flag alarm meter. 0-1 ma, 500 ohm load to receiver output, 2% accuracy. This arrangement is equivalent to two flag alarms in parallel.

(9) RCA Jr. Vacuum Tube Voltmeter or equivalent.

(c) INSPECTION. - Insert the power and control plug and perform the following inspection checks before starting the alignment procedures:

(1) Apply the d-c power and observe lighting of all tube heaters, operation of K-112 relay and rotation of dynamotor.

(2) Check B+ line for polarity at about 250 volts.

(3) Check relay frequency selection of K-101 thru and including K-111.

(d) I.F. ALIGNMENT. - Use Boonton 212A 20.7 mc output lead with 47 ohm 1/4 watt parallel resistor or GR805C or equivalent correctly terminated and 20.7 mc crystal frequency spotter.

(1) Inject 20.7 mc through pin 1 (grid) and 2 or 7 (cathode-ground).

(2) Connect VTVM to C-138 and observe peak AVC during IF peaking.

(3) Start I.F. alignment with secondary (bottom) of T-104 and end with the primary (top) of T-101. Final retouch of peaked alignment should be made at 2.0 volts AVC.

(4) I.F. sensitivity at 20.7 mc should be in the range of 40 to 100 uV for 2.0V AVC.

(5) Alternate I.F. alignment can be made with a Measurement 65B or 80, GR805B or equivalent generator and a 20.7 crystal signal spotter. Use no modulation and steps (1) to (4) above.

(e) OSCILLATOR-MULTIPLIER ALIGNMENT.

(1) Select crystal for 332.0 mc operation.

(2) Attach VTVM to test post at R-153 for first multiplier and then at R-157 for second multiplier and also final adjustment. Always "swamp" the associated winding by shorting turns or whole winding. The r-f transformers are over coupled.

(3) Adjust L-106 and then L-107 slugs for maximum rectified grid voltage at R-153.

(4) Adjust L-108 and then L-109 slugs for maximum rectified grid voltage at R-157.

(5) Retouch L-106 through and including L-109 with VTVM on R-157 for maximum peaking as a final alignment.

(6) Adjust C-159 for maximum sensitivity during r-f alignment in paragraphs following.

(f) R.F. COIL ALIGNMENT.

(1) Select crystal for 332.0 mc operation.

(2) Connect output from 212B signal generator to antenna terminal of receiver.

(3) Connect VTVM to AVC line at C-138.

(4) Adjust C-101, C-107, C-108, C-113, and C-114 for peak AVC voltage. Always "swamp' the associated winding of the transformer by shorting between or across turns. The r-f transformers are overcoupled.

(5) Retouch variable capacitors in step 4. above for the final alignment.

(g) CONTROL ADJUSTMENTS.

(1) Connect output from Boonton 212B signal generator to antenna terminal of the receiver at 332.0 mc.

(2) Connect VTVM to AVC line at C-138 to check signal generator tuning.

(3) Caution --- observe deflection and flag meters to prevent undue meter pegging.

(4) Apply 500 uV on-course r-f input.

(5) Set R-125, Sensitivity Control, to its minimum resistance position and lock in place. R-131, course softening control, should be set for minimum resistance during preliminary adjustments. Adjust R-133, Audio Sensitivity Control, for a 820 uA flag alarm current.

(6) Adjust R-161, balance control, to the extreme clockwise position and also the extreme counterclockwise position and check for deflections of not less than 20 uA.

(7) Adjust R-161 for zero uA on 100-0-100 scale of deflection meter.

(8) Apply 10,000 uV off-course inputs.

(9) Adjust R-133, audio sensitivity control, for off-course deflection of 57 uA.

(10) Apply 500 uV off-course inputs.

(11) Adjust R-131, course softening control, for off-course deflections of 65 uA.

(12) Repeat paragraphs 8,9,10, and 11 until no better adjustment can be made. Readjust R-161, balance control if necessary.

(h) AVC CHARACTERISTIC

(1) With R-131 and R-133 adjusted in accordance with step 12 in paragraph (g), check the deflection and flag currents for both tones at 500 uV and 10,000 uV at 329.3 and 335.0 mc.

(2) The deflection currents shall be 65 $\pm$ 5 uA for 500 uV and 55 +5/-0 uA for 10,000 uV. The total flag current shall be 820 $\pm$ 80 uA for 500uV. A slight readjustment of R-133 may be necessary.

(3) At 332.0 mc record the deflections on both sides and also with an on-course signal at 5, 10, 20, 40, 100, 500, 2000, 5000, 20,000, 50,000, and 100,000 uV.

(4) The deflection output currents should not rise above the values recorded for the 40 uV for off-course input. The on-course centering error should not exceed ± 5.0 uA. The no r-f input signal flag current (noise) should not exceed 30 uA per flag.

TABLE 5-1

LIST OF CRYSTALS USED IN THE 51V RECEIVER

Reception Frequency (MC)	Crystal Frequency (KC)	Part Number
329.3	8572.222	291 6800 00
329.6	6435.416	291 6801 00
329.9	8588.888	291 6802 00
330.2	6447.917	291 6803 00
330.5	8605.555	291 6804 00
330.8	6460.416	291 6805 00
331.1	8622.222	291 6806 00
331.4	6472.917	291 6807 00
331.7	8638.888	291 6808 00
332.0	6485.416	291 6809 00
332.3	8655.555	291 6810 00
332.6	6497.917	291 6811 00
332.9	8672.222	291 6812 00
333.2	6510.416	291 6813 00
333.5	8688.888	291 6814 00
333.8	6522.917	291 6815 00
334.1	8705.555	291 6816 00
334.4	6535.416	291 6817 00
334.7	8722.222	291 6818 00
335.0	6547.917	291 6819 00

TABLE 5-2

LOCALIZE FREQ. V.S. GLIDE SLOPE FREQ.

LOCALIZER FREQ. MC.	GLIDE SLOPE FREQ. MC.
108.0	334.1
108.1	334.4
108.2	334.7
.3	335.0
.4	329.3
.5	329.6
.6	329.9
.7	330.2
.8	330.5
.9	330.8
109.0	331.1
.1	331.4
.2	331.7
.3	332.0
.4	332.3
.5	332.6
.6	332.9
.7	333.2
.8	333.5
.9	333.8
110.0	334.1
.1	334.4

(cont'd)

LOCALIZER FREQ. MC.	GLIDE SLOPE FREQ. MC.
.2	334.7
.3	335.0
.4	329.3
.5	329.6
.6	329.9
.7	330.2
.8	330.5
.9	330.8
111.0	331.1
.1	331.4
.2	331.7
.3	332.0
.4	332.3
.5	332.6
.6	332.9
.7	333.2
.8	333.5
.9	333.8

51V-1 GLIDE-PATH RECEIVER
List of tube voltages and resistances

1. All measurements with respect to chassis ground.
2. All measurements made with Simpson Model 260 meter, 20,000 ohms/volt.
3. No signal at antenna, dynamotor in place, R125 at maximum sensitivity position, receiver completely aligned and all potentiometers correctly set.

TUBE		PIN 1	PIN 2	PIN 3	PIN 4	PIN 5	PIN 6	PIN 7	PIN 8	PIN 9
V101	V.D.C.	-0.57	0	+12.7	+6.7	+155	+61	0	--	--
	Ohms	1,000,000	0	4.0	2.7	10,000	46,000	0	--	--
V102	V.D.C.	-0.41	0	+12.7	+6.7	+178	+63	0	--	--
	Ohms	1,000,000	0	4.0	2.7	4,500	38,000	0	--	--
V103	V.D.C.	-0.71	0	0	+5.9	+148	+29	0	--	--
	Ohms	100,000	0	0	1.6	49,000	470,000	0	--	--
V104	V.D.C.	-0.46	0	0	+5.9	+133	+75*	0	--	--
	Ohms	1,200,000	0	0	1.6	13,000	50,000*	0	--	--
V105	V.D.C.	-0.2	0	0	+5.9	+147	+74*	0	--	--
	Ohms	1,200,000	0	0	1.6	10,000	51,000*	0	--	--
V106	V.D.C.	-0.45	0	0	+5.9	+140	+68*	0	--	--
	Ohms	1,200,000	0	0	1.6	10,000	53,000*	0	--	--
V107	V.D.C.	+2.15	+2.15	+12.7	+19	+6.3	0	-0.12	--	--
	Ohms	100,000	100,000	4.0	6.0	6,300	0	480,000	--	--
V108	V.D.C.	-0.06	+1.65	+25	+19.5	+70	+55	+1.65*	--	--
	Ohms	1,600,000	820*	9.0	7.0	52,000	25,000	820*	--	--
V109	V.D.C.	+188	+29	+56	+19.5	+19.5	+184	+28	+57	+25
	Ohms	11,500	480,000	6,000	7.0	7.0	13,500	480,000	6,000	9.0
V110	V.D.C.	-1.3	+1.05	+19	+12.7	+163	+122	+1.05	--	--
	Ohms	105,000	160	6.0	4.0	5,000	37,000	160	--	--
V111	V.D.C.	-0.54	0	+6.7	+12.7	+187	+39	0	--	--
	Ohms	107,000	0	2.7	4.0	770	370,000	0	--	--
V112	V.D.C.	-0.75	0	+6.7	+12.7	+158	+45	0	--	--
	Ohms	107,000	0	2.7	4.0	23,000	370,000	0	--	--
V113	V.D.C.	+144	0	0	0	+144	0	0	--	--
	Ohms	2700	0	∞	0	2700	∞	0	--	--

* Will vary according to settings of controls.

16563

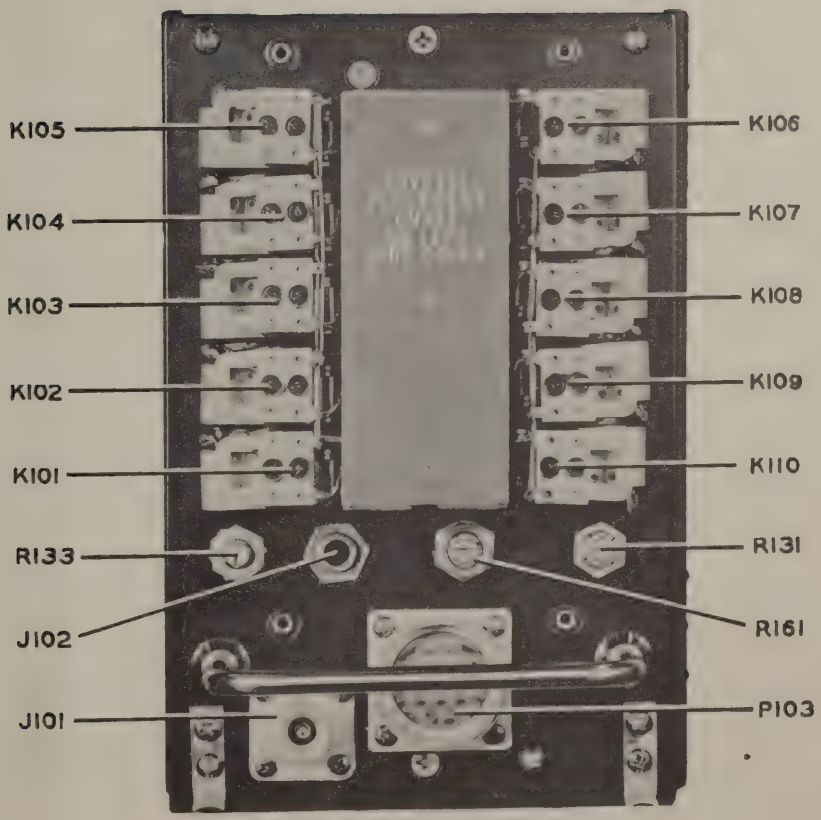


FIGURE 5-1 51V, FRONT OPEN

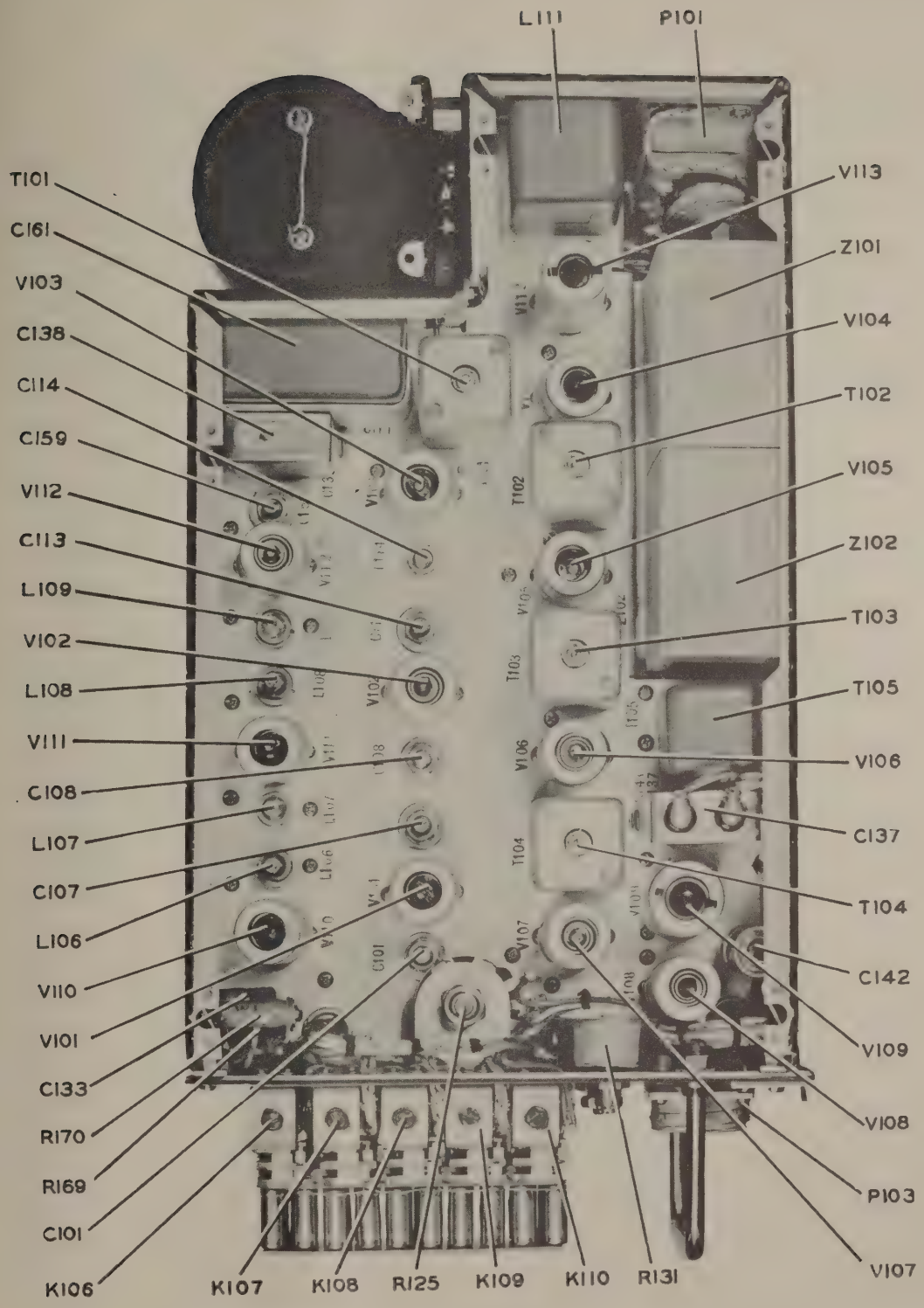


FIGURE 5-2 51V, RIGHT SIDE OPEN

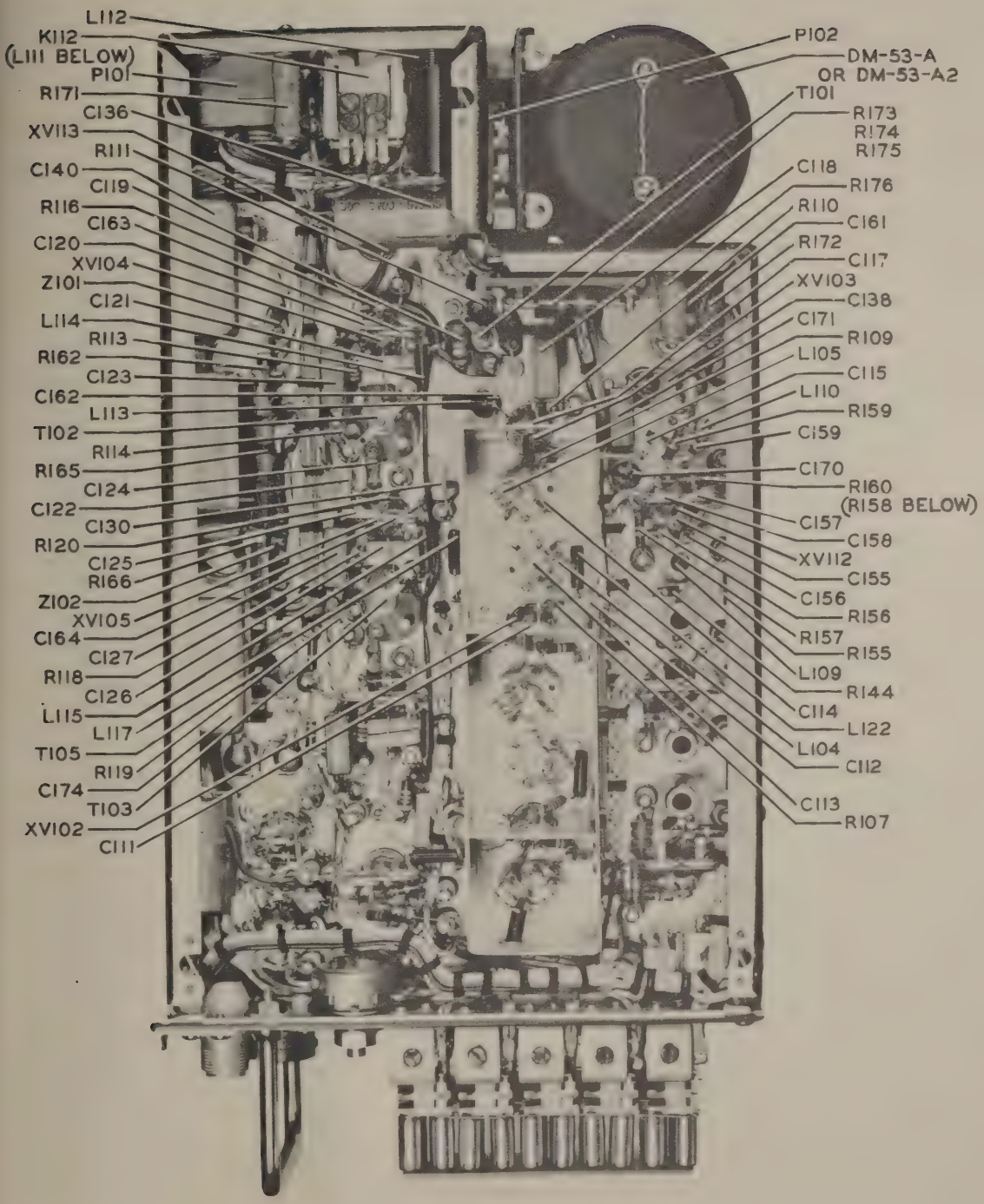


FIGURE 5-3 51V, LEFT SIDE OPEN
1 OF 2 PAGES

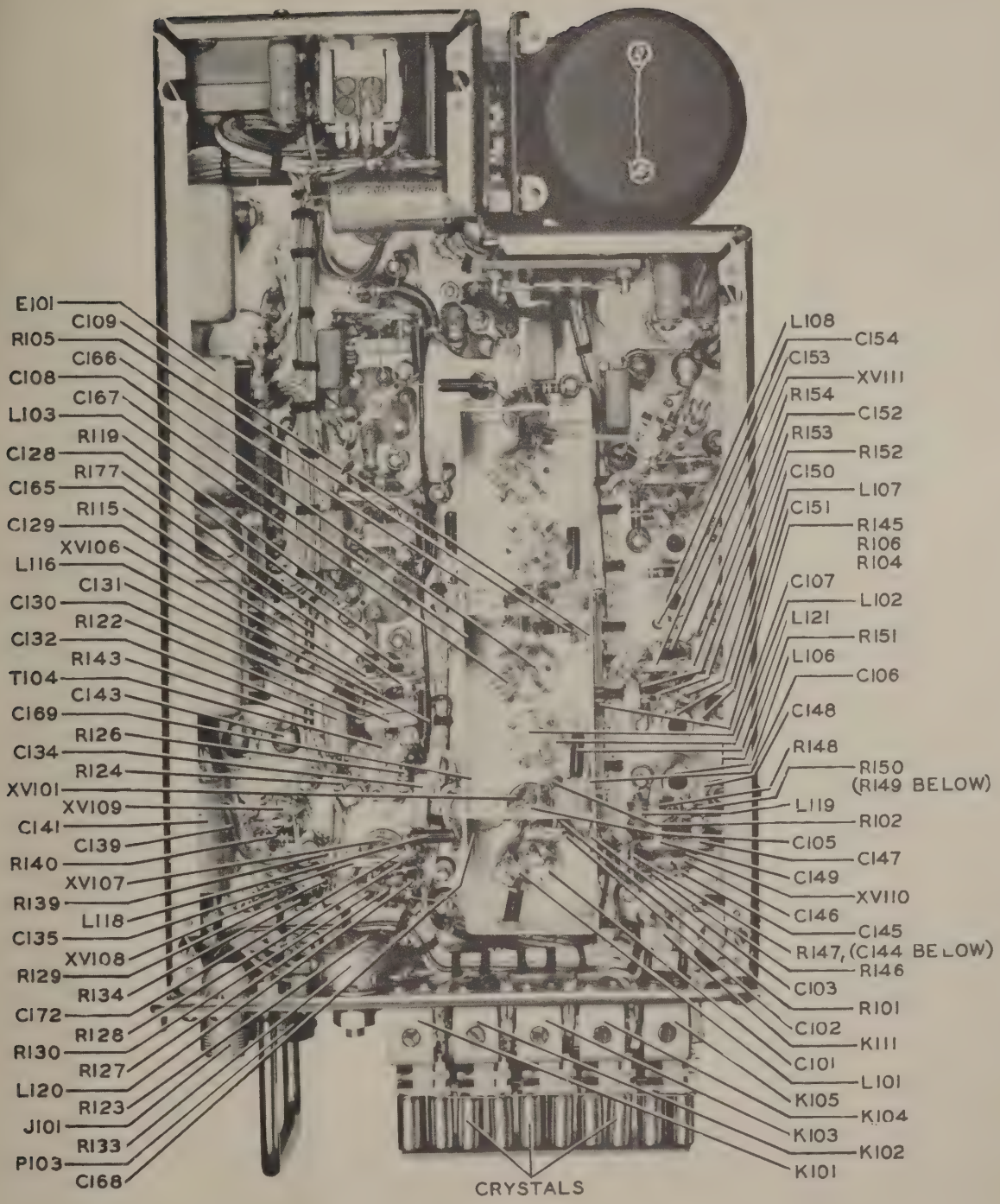
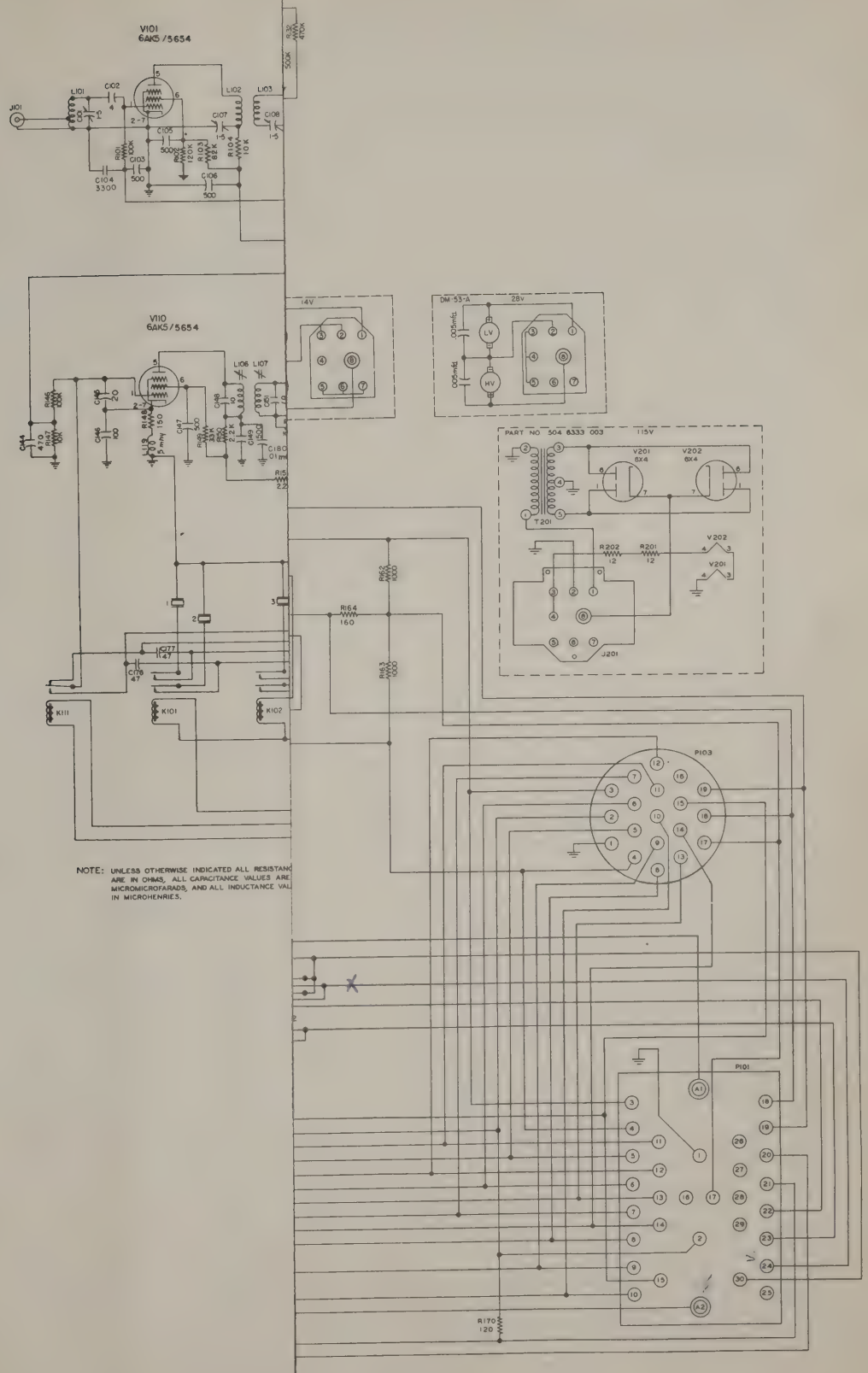


FIGURE 5-3 5IV, LEFT SIDE OPEN
2 OF2 PAGES



gure 5-4 51V Schematic Diagram

A2-24

NOTE: UNLESS OTHERWISE INDICATED ALL RESISTANCE VALUES ARE IN OHMS, ALL CAPACITANCE VALUES ARE IN MICROMICROFARADS, AND ALL INDUCTANCE VALUES ARE IN MICROHENRIES.

Figure 5-4 51V Schematic Diagram

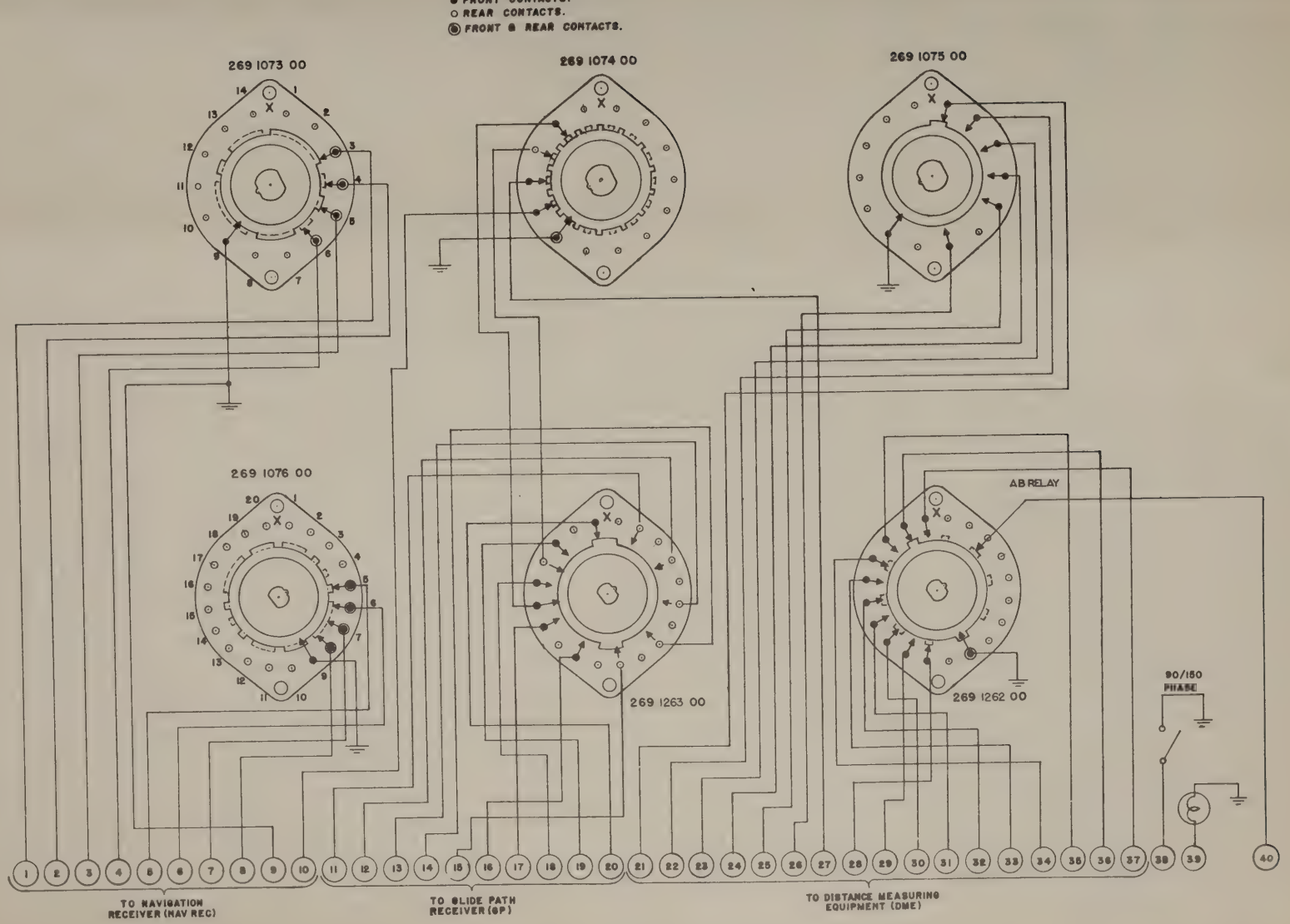

NOTE: ALL SWITCHES SHOWN IN FRONT VIEW AT 108.0 MC POSITION. FREQUENCY INCREASES IN CLOCKWISE DIRECTION.
● FRONT CONTACTS.
○ REAR CONTACTS.
◉ FRONT & REAR CONTACTS.
269 1073 00
269 1074 00
269 1075 00
269 1076 00
269 1263 00
269 1262 00
AB RELAY
90/150 PHASE
TO NAVIGATION RECEIVER (NAV REC)
TO GLIDE PATH RECEIVER (GP)
TO DISTANCE MEASURING EQUIPMENT (DME)

Figure 5-5 31AU-5&6 Schematic Diagram

51V-1 RECEIVER

ITEM	CIRCUIT FUNCTION	DESCRIPTION	COLLINS PART NUMBER
C-101	L101 tuning	CAPACITOR, variable: air dielectric; 1.55 to 5.14 mmf	922 0036 00
C-102	V101 grid blocking	CAPACITOR, ceramic: 4 mmf ±1/2 mmf; 500 wv	916 4381 00
C-103	V101 grid decoupling	CAPACITOR, mica: 500 mmf ±20%; 250 wv	912 0009 00
C-104	V101 grid decoupling	CAPACITOR: 3300 mmf ±10%, 500 wv	935 4074 00
C-105	V101 screen by-pass	CAPACITOR, mica: 500 mmf ±20%; 500 wv	912 0420 00
C-106	V101 plate decoupling	CAPACITOR, mica: 500 mmf ±20%; 250 wv	912 0009 00
C-107	V101 plate tuning	CAPACITOR, variable: air dielectric; 1.55 to 5.14 mmf	922 0036 00
C-108	V102 grid tuning	CAPACITOR, variable: air dielectric; 1.55 to 5.14 mmf	922 0036 00
C-109	V102 grid decoupling	CAPACITOR, mica: 500 mmf ±20%; 250 wv	912 0009 00
C-110		CAPACITOR: Not used	
C-111	V102 screen by-pass	CAPACITOR: mica; 500 mmf ±20%; 500 wv	912 0420 00
C-112	V102 plate decoupling	CAPACITOR, mica: 500 mmf ±20%; 250 wv	912 0009 00
C-113	V102 plate tuning	CAPACITOR, variable: air dielectric; 1.55 to 5.14 mmf	922 0036 00
C-114	V103 grid tuning	CAPACITOR, variable: air dielectric; 1.55 to 5.14 mmf	922 0036 00
C-115	HF Osc. Coupling	CAPACITOR, ceramic: 2 mmf ±1/2 mmf; 500 wv	916 4374 00
C-116	V108 grid filter	CAPACITOR, mica: 2200 mmf ±10%, 500 wv	935 4067 00
C-117	V103 screen by-pass	CAPACITOR, mica: 500 mmf ±20%, 500 wv	912 0420 00
C-118	V103 plate by-pass	CAPACITOR, mica: 10,000 mmf ±10%;300 wv	935 2117 00

ITEM	CIRCUIT FUNCTION	DESCRIPTION	COLLINS PART NUMBE
C-119	V104 grid blocking	CAPACITOR, ceramic: 47 mmf ±2%; 500 wv	913 0524 0
C-120	V104 grid decoupling	CAPACITOR, mica: 500 mmf ±20%; 500 wv	912 0420 0
C-121	V104 plate decoupling	CAPACITOR, mica: 470 mmf ±10%; 500 wv	935 0134 0
C-122	V104 screen by-pass	CAPACITOR, mica: 470 mmf ±10%; 500 wv	935 0134 0
C-123	V104 plate by-pass	CAPACITOR, mica: 10,000 mmf ±10%; 300 wv	935 2117 0
C-124	V105 grid blocking	CAPACITOR, ceramic: 47 mmf ±2%; 500 wv	913 0524 0
C-125	V105 grid decoupling	CAPACITOR, mica: 500 mmf ±20%; 500 wv	912 0420 0
C-126	V105 screen by-pass	CAPACITOR, mica: 470 mmf ±10%; 500 wv	935 0134 0
C-127	V105 plate by-pass	CAPACITOR, mica: 10,000 mmf ±10%; 300 wv	935 2117 0
C-128	V106 grid blocking	CAPACITOR, ceramic: 47 mmf ±2%; 500 wv	913 0524 0
C-129	V106 grid decoupling	CAPACITOR, mica: 500 mmf ±20%; 500 wv	912 0420 0
C-130	V106 screen decoupling	CAPACITOR, mica: 470 mmf ±10%; 500 wv	935 0134 0
C-131	V106 screen by-pass	CAPACITOR, mica: 470 mmf ±10%; 500 wv	935 0134 0
C-132	V106 plate by-pass	CAPACITOR, mica: 10,000 mmf ±10%; 300 wv	935 2117 0
C-133	Relay line filter	CAPACITOR, mica: 10,000 mmf ±10%; 300 wv	935 2117 0
C-134	det. filter	CAPACITOR, mica: 470 mmf ±10%; 500 wv	935 0134 0
C-135	V107 cathode by-pass	CAPACITOR, mica: 500 mmf ±20%; 500 wv	912 0420 0
C-136	Relay line filter	CAPACITOR, paper: 100,000 mmf ±20%;600 wv	930 0029 0
C-137	Audio coupling		
C-138	AVC time constant	CAPACITOR, paper: 1.0 mmf ±10%; 600 wv	930 0080 0
C-139	V108 grid blocking	CAPACITOR, paper: 1 mf ±20%; 600 wv	930 0058 0
C-140	V108 screen bypass	CAPACITOR, paper: 0.5 mf +40-15%; 600 wv	961 5350 0
C-141	Audio Coupling	CAPACITOR, paper: 1 mf ±20%; 600 wv	930 0058 0

ITEM	CIRCUIT FUNCTION	DESCRIPTION	COLLINS PART NUMBER
C-142	V109 grid	CAPACITOR, paper: 100,000 mmf ±20%;600wv	930 0029 00
C-143	Audio Coupling	CAPACITOR, paper: 250,000 mmf ±10%;400wv	930 0089 00
C-144	R-F filter	CAPACITOR, mica: 470 mmf ±10%; 500 wv	935 0134 00
C-145	Feedback	CAPACITOR, ceramic: 20 mmf ±5%; 500 wv	916 4420 00
C-146	V110 Cathode by-pass	CAPACITOR, ceramic: 100 mmf ±5%; 500 wv	916 4059 00
C-147	V110 screen by-pass	CAPACITOR, mica: 500 mmf ±20%; 500 wv	912 0420 00
C-148	V110 plate tuning	CAPACITOR, ceramic: 10 mmf ±1 mmf; 500wv	916 4406 00
C-149	V110 plate by-pass	CAPACITOR, mica: 500 mmf ±20%; 500 wv	912 0420 00
C-150	V111 grid blocking	CAPACITOR, ceramic: 100 mmf ±10%; 500 wv	916 4003 00
C-151	V111 grid tuning	CAPACITOR, ceramic: 10 mmf ±1 mmf; 500wv	916 4406 00
C-152	V111 screen by-pass	CAPACITOR, mica: 500 mmf ±20%; 500 wv	912 0420 00
C-153	V111 plate by-pass	CAPACITOR, mica: 500 mmf ±20%; 500 wv	912 0420 00
C-154	V111 plate tuning	CAPACITOR, ceramic: 7 mmf ±1 mmf; 500 wv	916 4394 00
C-155	V111 plate by-pass	CAPACITOR, ceramic: 100 mmf ±10%; 500 wv	916 4003 00
C-156	V-112 grid tuning	CAPACITOR, ceramic: 7 mmf ±1 mmf; 500 wv	916 4394 00
C-157	V-112 screen by-pass	CAPACITOR, mica: 500 mmf ±20%; 500 wv	912 0420 00
C-158	V-112 plate decoupling	CAPACITOR, mica: 500 mmf ±20%; 500 wv	912 0420 00
C-159	V-112 plate detuning	CAPACITOR, variable: air dielectric; 1.55 to 5.14 mmf	922 0036 00
C-160	Filter	CAPACITOR, mica: 10,000 mmf ±10%; 300 wv	935 2117 00
C-161	Filter	CAPACITOR, paper: 4.0 mf ±20%; 600 wv	930 6213 00
C-162	V103 filament by-pass	CAPACITOR, mica: 500 mmf ±20%; 500 wv	912 0301 00
C-163	V104 filament by-pass	CAPACITOR, mica: 500 mmf ±20%; 500 wv	912 0420 00

ITEM	CIRCUIT FUNCTION	DESCRIPTION	COLLINS PART NUMBER
C-164	V105 filament by-pass	CAPACITOR, mica: 500 mmf ±20%; 500 wv	912 0420 00
C-165	V106 filament by-pass	CAPACITOR, mica: 500 mmf ±20%; 500 wv	912 0420 00
C-166	V102 filament by-pass	CAPACITOR, mica: 500 mmf ±20%; 250 wv	912 0009 00
C-167	V102 filament by-pass	CAPACITOR, mica: 500 mmf ±20%; 250 wv	912 0009 00
C-168	V101 filament by-pass	CAPACITOR, mica: 500 mmf ±20%; 250 wv	912 0009 00
C-169	V101 filament by-pass	CAPACITOR, mica: 500 mmf ±20%; 250 wv	912 0009 00
C-170	Filament by-pass	CAPACITOR, mica: 500 mmf ±20%; 500 wv	912 0301 00
C-171	Filament by-pass	CAPACITOR, mica: 10,000 mmf ±10%; 300 wv	935 2117 00
C-172	V107 filament by-pass	CAPACITOR, mica: 500 mmf ±20%; 500 wv	912 0420 00
C-173	V108 filament by-pass	CAPACITOR, mica: 470 mmf ±10%; 500 wv	935 0134 00
C-174	Filter choke tuning	CAPACITOR, paper: 1 mf +40-15%; 100 wv	961 5278 00
C-175	V112 filament by-pass	CAPACITOR, mica: 470 mmf ±10%; 500 wv	935 0134 00
C-176	Crystal isolating	CAPACITOR, ceramic: 47 mmf ±5%; 500 wv	916 4463 00
C-177	Crystal isolating	CAPACITOR, ceramic: 47 mmf ±5%; 500 wv	916 4463 00
C-178	Crystal isolating	CAPACITOR, ceramic: 47 mmf ±5%; 500 wv	916 4463 00
C-179	Crystal isolating	CAPACITOR, ceramic: 47 mmf ±5%; 500 wv	916 4463 00
C-180	V110 plate by-pass	CAPACITOR, mica: 10,000 mmf ±10%; 300 wv	935 2117 00
C-181	Fil by-pass	CAPACITOR, mica: 470 mmf ±10%; 500 wv	935 0134 00
E-101	Course Indicator	RECTIFIER, metallic: input 6 v at 60 cyc	353 0016 00
E-102		INSULATOR, standoff; cylindrical	190 1105 00
E-103		INSULATOR, standoff: cylindrical	500 8923 001
E-104		SHIELD, tube: bayonet mtg	141 0001 00

ITEM	CIRCUIT FUNCTION	DESCRIPTION	COLLINS PART NUMBER
E-105		SHIELD, tube: bayonet mtg	141 0002 00
E-106		SHIELD, tube: bayonet mtg	141 0103 00
E-107		SHIELD, tube: bayonet mtg	141 0105 00
J-101	Antenna	CONNECTOR, receptacle: single round female contact	357 9003 00
J-102	Test	JACK, telephone: for 2 conductor plug	358 1080 00
K-101	Freq. Selector	RELAY, armature: contact arrangement 2A	972 1164 00
K-102	Freq. Selector	RELAY, armature: contact arrangement 2A	972 1164 00
K-103	Freq. Selector	RELAY, armature: contact arrangement 2A	972 1164 00
K-104	Freq. Selector	RELAY, armature: contact arrangement 2A	972 1164 00
K-105	Freq. Selector	RELAY, armature: contact arrangement 2A	972 1164 00
K-106	Freq. Selector	RELAY, armature: contact arrangement 2A	972 1164 00
K-107	Freq. Selector	RELAY, armature: contact arrangement 2A	972 1164 00
K-108	Freq. Selector	RELAY, armature: contact arrangement 2A	972 1164 00
K-109	Freq. Selector	RELAY, armature: contact arrangement 2A	972 1164 00
K-110	Freq. Selector	RELAY, armature: contact arrangement 2A	972 1164 00
K-111	Freq. Selector	RELAY, armature: contact arrangement 1B, 1A	972 1165 00
K-112	Primary Power	RELAY, armature: contact arrangement 1A1A	972 1170 00
L-101	Antenna tuning	COIL, RF: single wnd; single layer wnd; 2-1/2 turns (Part of Z-103)	
L-102	RF tuning	COIL, RF: single wnd; single layer wnd; 3-1/2 turns (Part of Z-104)	
L-103	RF tuning	COIL, RF: single wnd; single layer wnd; 3-1/2 turns (Part of Z-105)	

ITEM	CIRCUIT FUNCTION	DESCRIPTION	COLLINS PART NUMBER
L-104	RF tuning	COIL, RF: single wnd; single layer wnd; 3-1/2 turns (Part of Z-106)	
L-105	RF tuning	COIL, RF: single wnd; single layer wnd; 3-1/2 turns (Part of Z-107)	
L-106	RF tuning	COIL, RF: single wnd; single layer wnd; 15 turns	504 3531 002
L-107	RF tuning	COIL, RF: single wnd; single layer wnd; 15 turns	504 3531 002
L-108	RF tuning	COIL, RF: single wnd; single layer wnd; 6 turns	504 3530 002
L-109	RF tuning	COIL, RF: single wnd; single layer wnd; 6 turns	504 3530 002
L-110	RF tuning	COIL, RF: single wnd; single layer wnd; 3-1/2 turns (Part of Z-108)	
L-111	Filter choke	REACTOR: 5 hy, 75 ma min 360 ohm DC resistance	678 0306 00
L-112	Choke	COIL, RF: single layer wnd; 48 turns	240 0048 00
L-113	Filament R-F Choke	COIL, RF: single wnd; single layer wnd; 45 turns	240 0012 00
L-114	Filament R-F Choke	COIL, RF: single wnd; single layer wnd; 45 turns	240 0012 00
L-115	Filament R-F Choke	COIL, RF: single wnd; single layer wnd; 45 turns	240 0012 00
L-116	Filament R-F Choke	COIL, RF: single wnd; single layer wnd; 45 turns	240 0012 00
L-117	Filament R-F Choke	COIL, RF: single wnd; single layer wnd; 45 turns	240 0012 00
L-118	Filament R-F Choke	COIL, RF: single wnd; single layer wnd; 45 turns	240 0012 00

ITEM	CIRCUIT FUNCTION	DESCRIPTION	COLLINS PART NUMBER
L-119	V-110 Cathode Choke	COIL, RF: 3 wnd; single layer wnd; 112 turns each section	503 4535 001
L-120	V102 plate R-F Choke	COIL, RF: single wnd; single layer wnd; 45 turns	240 0012 00
P-101	Main Power and Control	CONNECTOR, receptacle: 32 round male polarized contacts	370 2016 00
P-102	Dynamotor receptacle	CONNECTOR, receptacle: 8 round male polarized banana term	504 3527 002
P-103	Front Control	CONNECTOR, receptacle: 19 round male polarized contacts	371 3010 00
R-101	V101 grid	RESISTOR, composition; .10 megohm ±10%; 1/2 w	745 1170 00
R-102	V101 screen	RESISTOR, composition: .12 megohm ±10%; 1/2 w	745 1174 00
R-103		RESISTOR, composition: 82000 ohm ±10%; 1/2 w	745 1167 00
R-104	V101 screen dropping	RESISTOR, composition: 10,000 ohm ±10%; 1/2 w	745 1128 00
R-105	V102 grid	RESISTOR, composition: .10 megohm ±10%; 1/2 w	745 1170 00
R-106	V102 grid decoupling	RESISTOR, composition: 47,000 ohm ±10%; 1/2 w	745 1156 00
R-107	V102 screen	RESISTOR, composition: 68,000 ohm ±10%; 1/2 w	745 1163 00
R-108		RESISTOR, composition: 3300 ohm ±10%; 1/2 w	745 1107 00
R-109	V103 grid	RESISTOR, composition: .10 megohm ±10%; 1/2 w	745 1170 00
R-110	V103 screen	RESISTOR, composition: .47 megohm ±10%; 1/2 w	745 1198 00

ITEM	CIRCUIT FUNCTION	DESCRIPTION	COLLINS PART NUMBER
R-111	V103 plate decoupling	RESISTOR, composition: 47,000 ohm ±10%; 1/2 w	745 1156 00
R-112	V104 grid	RESISTOR, composition: .33 megohm ±10%; 1/2 w	745 1191 00
R-113	V104 screen	RESISTOR, composition: 47,000 ohm ±10%; 1/2 w	745 1156 00
R-114	V104 plate decoupling	RESISTOR, composition: 10,000 ohm ±5%; 1 w	745 3127 00
R-115	V104 plate dropping	RESISTOR, composition: 2200 ohm ±10%; 1/2 w	745 1100 00
R-116	AVC decoupling	RESISTOR, composition: 10,000 ohm ±10%; 1/2 w	745 1128 00
R-117	V105 grid	RESISTOR, composition: .33 megohm ±10%; 1/2 w	745 1191 00
R-118	V105 screen	RESISTOR, composition: 47,000 ohm ±10%; 1/2 w	745 1156 00
R-119	V105 plate decoupling	RESISTOR, composition: 10,000 ohm ±5%; 1 w	745 3127 00
R-120	V105 grid decoupling	RESISTOR, composition: 10,000 ohm ±10%; 1/2 w	745 1128 00
R-121	V106 grid	RESISTOR, composition: .33 megohm ±10%; 1/2 w	745 1191 00
R-122	V106 screen	RESISTOR, composition: 47,000 ohm ±10%; 1/2 w	745 1156 00
R-123	AVC series	RESISTOR, composition: .47 megohm ±10%; 1/2 w	745 1198 00
R-124	V106 plate decoupling	RESISTOR, composition: 10,000 ohm ±5%; 1 w	745 3127 00
R-125	R-F gain control	RESISTOR, variable: wire-wound; 10,000 ohm ±10%; 2 w	376 0056 00

ITEM	CIRCUIT FUNCTION	DESCRIPTION	COLLINS PART NUMBER
R-126	Detector load	RESISTOR, composition: 47,000 ohm ±10%; 1/2 w	745 1156 00
R-127	Detector load	RESISTOR, composition: 47,000 ohm ±10%; 1/2 w	745 1156 00
R-128	V-107 Cathode	RESISTOR, composition: 6800 ohm ±10%; 1/2 w	745 1121 00
R-129	AVC delay Voltage dropping	RESISTOR, composition: .15 megohm ±10%; 1/2 w	745 1177 00
R-130	AVC time constant	RESISTOR, composition: .47 megohm ±10%; 1/2 w	745 1198 00
R-131	V108 bias adjust	RESISTOR, variable; wire-wound; 1500 ohm ±10%; 2 w	377 0108 00
R-132	Audio series	RESISTOR, composition: .47 megohm ±10%; 1/2 w	745 1198 00
R-133	Audio gain control	RESISTOR, variable: .50 megohm ±20%; 1 w	376 0010 00
R-134	V108 screen bleeder	RESISTOR, composition: 47,000 ohm ±10%; 1/2 w	745 1156 00
R-135	V108 screen	RESISTOR, composition: 47,000 ohm ±10%; 1/2 w	745 1156 00
R-136	V108 plate	RESISTOR, composition: 47,000 ohm ±10%; 1/2 w	745 1156 00
R-137	V109 grid	RESISTOR, composition: .47 megohm ±10%; 1/2 w	745 1198 00
R-138		RESISTOR: Not used	
R-139	V109 Cathode	RESISTOR, composition: 5600 ohm ±10%; 1w	745 3118 00
R-140	V109 grid	RESISTOR, composition: .47 megohm ±10%; 1/2 w	745 1198 00
R-141	V109 Cathode	RESISTOR, composition: 470 ohm ±10%;1/2w	745 1072 00

ITEM	CIRCUIT FUNCTION	DESCRIPTION	COLLINS PART NUMBER
R-142		RESISTOR: Not used	
R-143	Plate decoupling	RESISTOR, composition: 330 ohm ±10%;1/2 w	745 1065 00
R-144	Plate decoupling	RESISTOR, composition: 330 ohm ±10%;1/2 w	745 1065 00
R-145	Plate decoupling	RESISTOR, composition: 330 ohm ±10%;1/2 w	745 1065 00
R-146	V110 grid	RESISTOR, composition: .10 megohm ±10%; 1/2 w	745 1170 00
R-147	V110 grid	RESISTOR, composition: 10,000 ohm ±10%; 1/2 w	745 1118 00
R-148	V110 Cathode	RESISTOR, composition: 150 ohm ±10%;1/2 w	745 1051 00
R-149	V110 screen	RESISTOR, composition: 33,000 ohm ±10%; 1/2 w	745 1149 00
R-150	V110 plate decoupling	RESISTOR, composition: 2200 ohm ±10%; 1/2 w	745 1100 00
R-151	V110 plate dropping	RESISTOR, composition: 2200 ohm ±10%; 1/2 w	745 1100 00
R-152	V111 grid	RESISTOR, composition: .10 megohm ±10%; 1/2 w	745 1170 00
R-153	V111 grid	RESISTOR, composition: 10,000 ohm ±10%; 1/2 w	745 1128 00
R-154	V111 screen	RESISTOR, composition: 330,000 ohm ±10%; 1/2 w	745 1191 00
R-155	Plate decoupling	RESISTOR, composition: 220 ohm ±10%;1/2 w	745 1058 00
R-156	V-112 grid	RESISTOR, composition: .10 megohm ±10%; 1/2 w	745 1170 00
R-157	V-112 grid	RESISTOR, composition: 10,000 ohm ±10%; 1/2 w	745 1128 00
R-158	V112 screen	RESISTOR, composition: 330,000 ohm ±10%; 1/2 w	745 1191 00

ITEM	CIRCUIT FUNCTION	DESCRIPTION	COLLINS PART NUMBER
R-159	V112 plate decoupling	RESISTOR, composition: 22,000 ohm ±10%; 1/2 w	745 1142 00
R-160	V112 plate dropping	RESISTOR, composition: 1,000 ohm ±10%; 1/2 w	745 1086 00
R-161	Course adjust	RESISTOR, variable: wire-wound; 10,000 ohm ±10%; 2 w	377 0111 00
R-162	Rectifier series	RESISTOR,..wire-wound: 1000 ohm ±5%; 1 w	708 0109 00
R-163	Rectifier series	RESISTOR, wire-wound: 1000 ohm ±5%; 1 w	708 0109 00
R-164	Flag alarm load	RESISTOR, wire-wound: 390 ohm ±5%; 1/2 w	707 9227 00
R-165	Course load	RESISTOR, composition: 3900 ohm ±10%; 1/2 w	745 1111 00
R-166	Course load	RESISTOR, composition: 3900 ohm ±10%; 1/2 w	745 1111 00
R-167	Regulator tube dropping	RESISTOR, composition: 4700 ohm ±10%; 1 w	745 3114 00
R-168	Regulator tube dropping	RESISTOR, composition: 4700 ohm ±10%; 1w	745 3114 00
R-169	Relay dropping	RESISTOR, wire-wound: 120 ohm ±5%; 5 w	747 9026 00
R-170	Relay dropping	RESISTOR, wire-wound: 120 ohm ±5%; 5 w	747 9026 00
R-171	Relay dropping	RESISTOR, wire-wound: 120 ohm ±5%; 5 w	747 9026 00
R-172	Filament dropping	RESISTOR, wire-wound: 0.75 ohm ±10%; 5 w	747 9021 00
R-173	Filament equalizing	RESISTOR, composition: 56 ohm ±5%; 2 w	745 5033 00
R-174	Filament equalizing	RESISTOR, composition: 56 ohm ±5%; 2 w	745 5033 00
R-175	Filament equalizing	RESISTOR, composition: 120 ohm ±5%; 1 w	745 3047 00
R-176	Filament dropping	RESISTOR, wire-wound: 0.75 ohm ±10%; 5 w	747 9021 00
R-177		RESISTOR, composition: 10,000 ohm ±10%; 1/2 w	745 1128 00

ITEM	CIRCUIT FUNCTION	DESCRIPTION	COLLINS PART NUMBER
R-178		RESISTOR, composition: 82,000 ohm ±10%; 1/2 w	745 1167 00
T-101	IF input	TRANSFORMER, IF: intermediate stage; adj iron core tuning	504 3545 00
T-102	IF interstage	TRANSFORMER, IF: intermediate stage; adj iron core tuning	504 3545 00
T-103	IF interstage	TRANSFORMER, IF: intermediate stage; adj iron core tuning	504 3545 00
T-104	IF Output	TRANSFORMER, IF: intermediate stage; adj iron core tuning	504 3545 00
T-105	Output auto-transformer	TRANSFORMER, power: input 8000 ohm; output 32,000 ohm, 1500 TV	677 0305 00
TB-101		SUB-ASSEMBLY: resistor mtg board	504 3532 002
V-101	RF amp.	TUBE: Arinc type #5654; RF pentode	253 0001 00
V-102	RF amp.	TUBE: Arinc type #5654; RF pentode	253 0001 00
V-103	Mixer	TUBE: Arinc type #5654; RF pentode	253 0001 00
V-104	IF amp.	TUBE: Arinc type #5654; RF pentode	253 0001 00
V-105	IF amp.	TUBE: Arinc type #5654; RF pentode	253 0001 00
V-106	IF amp.	TUBE: Arinc type #5654; RF pentode	253 0001 00
V-107	Det.	TUBE: Arinc 5726 6AL5; twin diode	253 0003 00 257 0018 00
V-108	1 St. Audio	TUBE: Arinc 5749 6BA6; pentode	253 0005 00 255 0185 00
V-109	Output Audio	TUBE: 12AU7; twin triode	255 0199 00
V-110	Oscillator	TUBE: Arinc type #5654; RF pentode	253 0001 00
V-111	Freq. Mult.	TUBE: Arinc type #5654; RF pentode	253 0001 00

ITEM	CIRCUIT FUNCTION	DESCRIPTION	COLLINS PART NUMBER
V-112	Freq. Mult.	TUBE: Arinc type #5654; RF pentode	253 0001 00
V-113	Voltage reg.	TUBE: JAN type 0A2; voltage regulator	257 0052 00
XV-101, XV-102, XV-103, XV-104, XV-105, XV-106, XV-107, XV-108	Sockets for V-101, V-102, V-103, V-104, V-105, V-106, V-107, V-108	SOCKET, tube: 7 contact miniature	220 1034 00
XV-109	Socket for V109	SOCKET, tube: 9 contact miniature	220 1063 00
XV-110, XV-111, XV-112, XV-113	Sockets for V-110, V-111, V-112, V-113	SOCKET, tube: 7 contact miniature	220 1034 00
XY-114	Crystal socket assembly	SOCKET, Crystal: accomodates 20 type CR-7 quartz crystals	504 3547 003
Z-101	90 cycle filter	FILTER, bandpass: 90 cps bandpass center frequency	673 0162 00
Z-102	150 cycle filter	FILTER, bandpass: 150 cps bandpass center frequency	673 0163 00
Z-103	Antenna tuning	SUB-ASSEMBLY: includes C-101 and L-101	504 3529 002
Z-104	RF tuning	SUB-ASSEMBLY; includes C-107 and L-102	504 3528 002
Z-105	RF tuning	SUB-ASSEMBLY: includes C-108 and L-103	504 3528 002
Z-106	RF tuning	SUB-ASSEMBLY: includes C-113 and L-104	504 3528 002
Z-107	RF tuning	SUB-ASSEMBLY: includes C-114 and L-105	504 3528 002
Z-108	RF tuning	SUB-ASSEMBLY: includes C-159 and L-110	504 3528 002

ITEM	CIRCUIT FUNCTION	DESCRIPTION	COLLINS PART NUMBER
51V-1 400 cps POWER SUPPLY			
J-201	Input Plug		
R-201	Fil voltage dropping	RESISTOR: 12 ohm ±10%, 16 w	747 1021 00
R-202	Fil voltage dropping	RESISTOR: 12 ohm ±10%, 16 w	747 1021 00
T-201	Power	TRANSFORMER, Power: Pri: 115 v, Sec: 200 v CT, 1500 TV	672 0331 00
V-201	Rectifier	TUBE: JAN type 6X4; double di	255 0196 00
V-202	Rectifier	TUBE: JAN type 6X4; double di	255 0196 00
XV-201, XV-202	Sockets for V-201, V-202	SOCKET, tube: 7 contact miniature	220 1034 00